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Three Essays on Human Resource Management

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THREE ESSAYS ON HUMAN RESOURCE MANAGEMENT

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In the end it's all about a continuous learning process,

sharing of ideas and moments,

building friendships along the way,

discovering that although we are coming from different parts of the world,

we have more things in common than differences,
and showing to those who always believed we can...
that they were right. Gracias.

Abstract

This thesis comprises three essays on human resource management. The first one studies the effect of on-the-job training on firm productivity using a micro-dataset of a large firm in Greece for the period 2005 to 2006. The data consist of daily observations on the productivity of the same workers tracked before, during, and after the receipt of training. Overall, the empirical findings show that after the implementation of on-the-job training, productivity improves by almost 6.5 percent. Results are further complemented by providing alternative evidence and interpretations for the training effect observed.

The second essay tests how high performance work practices, and work uncertainty are associated with employee overtime as an indicator of work intensification. It proposes a multiple mediator model in which different practices act as mediating mechanisms between work uncertainty and employee overtime. Hypotheses are tested using the European Working Conditions Survey (EWCS) of 2005. Results indicate that practices such as training, task rotation, and teamwork consistently appear to have a positive association with employee overtime, while discretion mechanisms have a negative or no association with it. Work uncertainty appears to have a strong and positive relationship with employee overtime as well; however, the mediating role of high performance work practices seems to account for some, but not all, of this relationship.

The third paper examines the link between task characteristics, employee learning and career prospects. It aims to address this issue by developing a set of hypotheses testing how task variety versus task specialization is related to employee learning, and employee career prospects within an organization. Additionally, it examines the interactive effects of giving employee discretion, and different tasks assignments on individual learning and employee career prospects respectively. Hypotheses are evaluated by analyzing data from the fourth and the fifth wave of the European Working Conditions Survey. Results indicate that employees exhibit higher learning and higher intentions for career growth when their jobs involve unrelated task rotation, and complex tasks rather than related

task rotation and monotonous tasks. Estimates support the complementarity hypothesis as well; however, show that different types of employee discretion influence differently the relationships of interest. The main findings produced add to the development of a comprehensive theory for integrating task assignments, learning and career prospects.

The main contributions of each paper can be summarized as follows. In the first paper, the dataset provides an unusual opportunity of using direct measures of firm productivity, exact information on content, length, purpose of training, and offers the possibility to monitor the firm over some time. The before-and-after body of information along with the training activity that took place at a specific point in time provide a unique laboratory to address methodological challenges encountered throughout this line of research; particularly the problems of unobserved heterogeneity and endogeneity of training. This makes an important contribution to previous literature that had difficulty in isolating and then measuring accurately the impact of training.

In the second paper, the study focuses on how high performance work practices are related to work intensification in the form of longer working hours. In this context, empirically basic hypothesis concerning the implications of working longer has generally not been tested. As it appears, there is scarcity of data availability on effort and much of the measures on work intensification are in a subjective form. However, spending longer hours at work as a more objective measure has been highly neglected. The paper aims to fill this gap. Further, it gives emphasis to other significant factors contributing to work intensification, and in particular examines how uncertainty at work could be driving some of the employee overtime. It adds to previous literature by arguing that this positive relationship could be mediated by the implementation of high performance work practices. If it is accepted that this has been an era of work intensification, then a better knowledge of possible sources of work intensification contributes to our understanding of this phenomenon.

In the third paper, it is pointed out that research on careers has examined whether rotating employees is a means through which individuals learn and develop their careers.

Here, it is conjectured though that the type of rotation might be of different importance in influencing learning and, by extension, the way individual careers are shaped. Also, it departs from previous research by supporting the idea that task assignments must be combined with a certain level of discretion, aiming to observe whether career advancement can be better leveraged through the possible complementarities between task assignments and employee discretion. Finally, previous findings seem somehow inconclusive and they often vary depending on the context. The latter issue is addressed using broader datasets to evaluate the hypothesized relationships.

Resumen

Esta tesis está compuesta por tres ensayos sobre la gestión de recursos humanos. El primero estudia el efecto de la formación en el trabajo en la productividad de la empresa usando una micro base de datos de una empresa grande griega entre los años 2005 y 2006. La base de datos consta de observaciones diarias sobre la productividad de un mismo grupo de empleados tomadas antes, durante y después de recibir formación. Globalmente, los resultados empíricos muestran que tras la implementación de la formación en el trabajo, la productividad mejora en casi un 6.5 por ciento. Estos resultados se complementan con evidencias e interpretaciones alternativas relacionadas con el efecto de formación observado.

El segundo ensayo evalúa cómo las prácticas de trabajo de alto desempeño y la incertidumbre del trabajo están asociadas con la intensificación del trabajo medida en horas extras. El ensayo propone un modelo con múltiples mediadores en el que las diferentes prácticas actúan como mecanismos mediadores entre la incertidumbre en el trabajo y el tiempo extra. Las hipótesis son probadas usando la encuesta europea sobre las condiciones de trabajo (EWCS) del año 2005. Los resultados indican que prácticas tales como la formación, la rotación de tareas y el trabajo en equipo están consistentemente asociadas con el tiempo extra. Por su parte, los mecanismos discrecionales están asociados negativamente o bien no tienen ninguna asociación con el tiempo extra. También, la incertidumbre laboral parece tener una relación fuerte y positiva con las horas extras. Sin embargo, el papel mediador de las prácticas de trabajo de alto desempeño parece eliminar una parte de esta relación.

El tercer ensayo examina el vínculo entre las características de las tareas, el aprendizaje de los empleados y las perspectivas de carrera. En particular, el artículo desarrolla un conjunto de hipótesis para probar cómo la variedad de tareas (frente a la especialización) está relacionada con el aprendizaje de los empleados. Además, el ensayo relaciona el asunto con el tema principal de este estudio al examinar como las asignaciones diver-

sas de tareas están asociadas con las perspectivas de carrera de los empleados dentro de una organización. Finalmente, examina la complementariedad potencial de otorgar discrecionalidad a los empleados, y cómo esto contribuye al aprendizaje de los empleados y sus perspectivas de carrera. Para el análisis los datos fueron recolectados de las EWCS de los años 2005 y 2010. En resumen, los resultados indican que los empleados exhiben mayor aprendizaje y mayores intenciones de avanzar en su carrera cuando sus trabajos involucran rotaciones de tareas inconexas y tareas complejas en vez de rotaciones y tareas monótonas. Los resultados también apoyan la hipótesis de la complementariedad.

Las principales contribuciones de cada artículo pueden resumirse como sigue. En el primero, la base de datos ofrece una oportunidad inusual para usar medidas directas de productividad empresarial, información exacta sobre el contenido, la duración y el propósito de la formación. Así mismo ofrece la posibilidad de monitorear la empresa a lo largo de algún tiempo. La información del antes y el después junto con la actividad de formación llevada a cabo en un punto específico del tiempo constituye un laboratorio único para enfrentar los retos metodológicos comunes en esta línea de investigación; en particular, problemas de heterogeneidad no observada y endogeneidad de la formación. Esta es una contribución importante a la literatura previa que tuvo dificultad en aislar y por lo tanto medir con precisión el impacto de la formación.

En el segundo artículo, el estudio se enfoca en cómo las prácticas de trabajo de alto rendimiento se relacionan con la intensificación del trabajo medida como horas de trabajo adicionales. En este contexto, empíricamente no se han probado hipótesis que conciernan las implicaciones de trabajar más horas. Como parece, hay escasez de datos disponibles sobre esfuerzo y muchas de las medidas de intensificación de trabajo son subjetivas en su forma. Mientras, la variable de pasar más horas en el trabajo, más objetiva, ha sido largamente desatendida. El artículo pretende cerrar este vacío. Además, subraya que existen otros factores significativos que contribuyen a la intensificación laboral, y examina cómo la incertidumbre en el trabajo puede estar creando parte de las horas extra. Contribuye a la literatura previa al argumentar que esta relación positiva puede

estar mediada por la implementación de prácticas de trabajo de alto rendimiento. Si se acepta que esta ha sido una era de intensificación laboral, entonces un conocimiento mejor de la posibles fuentes de intensificación contribuye a nuestro conocimiento de este fenómeno.

En el tercer ensayo, se puntualiza que la investigación sobre las carreras ha examinado si la rotación de empleados es un medio a través del cual los individuos aprenden y desarrollan sus carreras. Aquí, sin embargo, se conjetura que el tipo de rotación puede influenciar el aprendizaje de diversas formas y, por extensión, la forma en la que las carreras individuales son formadas. También se aleja de la investigación previa en cuanto que apoya la idea que las asignaciones de tareas deben combinarse con cierto nivel de discrecionalidad, tratando de observar si el avance en la carrera puede apalancarse mejor a través de posibles complementariedades entre asignación de tareas y discrecionalidad del empleado. Finalmente, resultados anteriores parecen de alguna manera no concluyentes y varían frecuentemente con el contexto. Este problema es solucionado usando bases de datos más amplias para evaluar las relaciones determinadas por las hipótesis.

Chapter 1

Introduction

1.1 Human Resource Management Issues

Over the years, there has been developed a fair amount of literature promoting the advantages of using high-involvement or high-commitment human resource practices. The dominant trend in this line of research has argued that the use of human resources practices will be reflected in better firm performance (e.g. Arthur 1994; Huselid 1995; MacDuffie 1995; Koch and McGrath 1996). One part of these studies has focused on the effects of the individual practices (e.g. Bartel 1994; Koch and McGrath 1996; Aragón-Sanchez, Barba-Aragón, and Sanz-Valle 2003). Among them, extensive training, employee participation, job redesign, team-based production systems, and performance-contingent incentive compensation are widely believed to improve the performance of organizations. The other part has moved focus on the interaction effects between practices considering the overall configuration of aggregation of different practices on firm performance (e.g. MacDuffie 1995; Delaney and Huselid 1996; Ichniowski, Shaw, and Prennushi 1997; Cappelli and Neumark 2001).

A related approach in the literature has aimed to identify how their greater individual or bundled use is further linked to different outcomes. Scholars have argued that organizations adopt various human resource practices in order to improve individual learning

in terms of skills and abilities, as well as enhance employee career prospects inside the organization, or both. Such practices include extensive training and job rotation as mechanisms through which employees accumulate more human capital (Eriksson and Ortega 2006) or discretion mechanisms which has been found to be closely associated not only with increased performance (Osterman 1995; Ortega 2009) and the quality of production (Ichniowski and Shaw 1999; Appelbaum, Bailey, Berg, and Kalleberg 2000); but also with giving employees the opportunity to develop new skills, and master a wider range of tasks and responsibilities (Parker 1998; Grant and Parker 2009).

The fact that these practices yield positive results is not doubtful. Nevertheless, there are perceptions suggesting that although the implementation of human resource practices leads to numerous positive outcomes, it may also cause negative consequences, particularly on the quality of employee working life. Previous research assess the implications of these practices on negative experiences at work, including greater tension, insufficient time to perform tasks, and missing deadlines (see more in Godard 2001; White et al. 2003). This is because, in the language of many scholars, human resource practices increase effectiveness by creating conditions where employees become highly involved in the firm and work hard to achieve its goals (Arthur, 1994; Wood and de Menezes 1998). Central here is the argument that positive performance outcomes resulted from the introduction of such practices may actually arise through the work intensification process.

All in all, previous developments in the field of human resource management give us many opportunities to explore additional intriguing aspects of it. Despite the rich repertoire of studies, there is still a lot of work to be done and further research is strongly encouraged in order to overcome limitations, fill empirical gaps, and address questions that have been unanswered in the literature. This thesis builds on an extensive body of past research on the impact of human resource practices on different outcomes and particularly attempts to shed some light on three different human resource management issues.

1.2 Thesis Structure

In this section, an overall perspective of the context of the thesis is provided. The second chapter is dedicated on the essay entitled "The impact of on-the-job training on firm productivity: The case of a bakery". The essay focuses on the effects of an individual human resource practice, on-the-job training. Previous work has mainly examined the effect of employee training using data from multiple firms, while others have adopted a case study approach (e.g. Bartel 1994; Black and Lynch 1996). There have been few studies outside the United States on the impact of human capital investments, such as training, on productivity. In addition, the majority of empirical studies on the employee training-productivity relationship are limited to very large firms, and little is known about the extent to which existing results are representative for smaller firms. The first study aims to extend previous work and answers, mainly, how the productivity of a company located in Greece has changed after the introduction of on-the-job training. It further aims to explain how extracting information from the productivity records of a single firm made it possible to avoid measurement errors and deficiencies frequently observed in previous studies, as suggested by Bartel (1995; 2000).

The third chapter presents the essay entitled "High performance work practices, work uncertainty, and employee overtime. The other side of the story". Overall the essay concentrates on the relationship between human resource practices and employee overtime as an indicator of work intensification. In the literature, one of the main presumptions is that the performance gains from human resources practices might arise from work intensification (e.g. Ramsay, Scholaries, and Harley 2000; Godard 2001; Green 2004). This has meant that scholars were encouraged to search alternative trajectories through which human resource practices could be studied. Thus, here using a broader dataset the paper seeks to evaluate the association between a variety of human resource practices and work intensification. Understanding this is important because the human resource practices thesis underpinning the benefits stemming from the adoption of these practices has been developed at a time work has been severely intensified.

The fourth one focuses on the essay entitled "Learning through task variety versus task specialization: Climbing a stairway to heaven. Who gets there?" The paper aims to explore learning and career implications of different task assignments. On relevance to this study is the literature on organization and individual learning which has indicated a number of references of how the learning rate might be affected by task specialization, related or unrelated task variation (Darr, Argote, and Epple 1995; Fischer and Ittner 1999; Schilling, Vidal, Ployhart, and Marangoni 2003). The literature on careers is also relevant and has given attention on the importance of task assignments supporting that they are a primary source of career learning (Campion, Cheraskin, and Stevens 1994). It is still unclear, however, whether employee career advancement is driven by learning from task variety or task specialization. This study extends previous literature and focuses on the employee learning and career advancement implications of task assignments in conjunction. This is important both for managers and employees because in leveraging experience they need to weigh the gains from specialized versus diverse experience in influencing not only learning and productivity, but also employees' ability to take more responsibility and advance their career within an organization.

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Chapter 2

The Impact of On-the-Job Training on Firm Productivity: The Case of Bakery

2.1 Introduction

It is evident that there have been several attempts to empirically explore the impact of employee training on firm productivity. These have largely taken advantage of various datasets and focused on different types of training and productivity measures to test this relationship. In general, studies find support for the prediction that training contributes significantly to higher productivity growth (Bartel 1994, 1995; Black and Lynch 1996; Koch and McGrath 1996; Barrett and O'Connell 2001). While such studies are numerous, and even though findings are reported to be positive and significant, they do not always depict a consistent picture. There is an observed variation in results attributed to the unique situations of firms or due to the fact that many of the studies in the literature contain serious methodological flaws which precludes relying on their results (Bartel 2000).

For instance, a large number of scholars have contributed to this research by exploit-

ing challenging broad cross-sectional datasets. However, findings stemming from these studies have been hampered by failure in correcting for the endogeneity of the training decision and had difficulty to account for unobserved heterogeneity (Bartel 1994; Black and Lynch 1996; Barrett and O'Connell, 2001). On the other hand, researchers have used panel data at the firm (Black and Lynch 1996; Barrett and O'Connell 2001) or the industry-level (Dearden, Reed, and Van Reenen 2006) in an effort to tackle these problems. However, studies using firm-level data have been hindered by the use of indirect measures of productivity such as changes in wage as proxy of workers' productivity and not actual productivity data as well as by poor measures of the training content or duration (Bartel 1995). Besides, the use of industry level data suffers from the fact that matching information at the industry-level engenders a great loss of micro-level information that may result in aggregation biases (Colombo and Stanca 2008).

In an effort to address the aforementioned issues, at least partly, researchers have started to turn attention to more detailed data gathered from one or few companies which provide the possibility to obtain specific information on the role of training, and the diverse production processes adopted (Bartel 1995; Ichniowski, Shaw, and Prennushi 1997) as well as rely on more direct measures of productivity. Although this approach helps to avoid the aforementioned methodological flaws, results stemming from case studies may fail to correct entirely for the endogeneity bias. Also, by definition case studies lead to the generalization problem according to which findings stemming from unique cases are very difficult to generalize to other contexts; whereas in the case of broader datasets, this problem is obviated.

There are both pros and cons attached to either of the approaches. Attempting to puzzle out this question, a review of the literature on studies that have estimated the impact of training on firm productivity under different types of datasets concludes that broad datasets are suffering from a number of biases. On the other hand, information extracted from one or very few companies has the potential to tackle the problems encountered in the large-sample studies. Specifically, there are three main ways to collect the

right data using insider econometrics to study productivity and get convincing evidence of the effects of adopting training practices; cross-organization studies based on plant visits, single-firm event studies, or plant visits and interviews conducted at few plants of a particular industry (see more Bartel 2000; Bartel, Ichniowski, and Shaw 2004).

In the present study, I use daily data derived from a single large company in Greece in an effort to identify the effects of on-the-job training on firm productivity. The dataset contains information on content, length, and purpose of training activity applied as well as a direct measure of productivity. A number of comprehensive controls have also been incorporated. Using these data, the paper contributes to the existing literature in several ways. First, the dataset provides an unusual opportunity of using precise measures of firm productivity, that is, the number of pieces produced per minute of production. Second, the availability of detailed information on training and daily information on productivity allow dealing with a number of problems, such as unobserved heterogeneity and endogeneity of training. Third, I am able to account for other factors that might impact the change in productivity including production order, resting time, and a different type of training. Fourth, I check the robustness of the main results in the baseline specification by focusing on subsamples. Finally, in addition to the main question and empirical findings, I examine and discuss alternative explanations of the training impact on productivity.

2.2 Previous Research

Previous work on the productivity effects of training reports evidence supporting that investment in training helps firms to develop more qualified employees that in return can improve firm performance. An indicative piece of work is presented by Bartel (1994) who measures the effect of employer-provided training on productivity utilizing firm-level data. The author uses a survey from 1986 on personnel policies and economic characteristics of 495 manufacturing business lines and finds evidence that companies which

implement training programs experience very high productivity levels. Further, Bartel (1995) reports findings of a positive and significant effect of formal on-the-job training on wage growth and job performance using a different dataset obtained from the personnel records of a single large firm, operating in the manufacturing sector, from 1986 to 1990. Her study shows that focusing on a single firm helps to control for individual heterogeneity in the estimations of the training impact on performance, as well as avoid important measurement problems that are commonly observed in the literature. Barrett and O' Connell (2001) further contribute to our understanding of the employee training-productivity relationship by following a conceptual framework in which investments in training, general versus specific[1], are associated with firm productivity. Their sample is collected from manufacturing, construction, and private service companies by carrying out two separate surveys that took place in 1993 and 1996-1997 respectively. Their first estimates reveal that the impact of the entire training activity is positive and significant, but the test of the differential effects of the two types of training shows that only general training has a statistically positive effect on productivity. In addition, work presented by Aragón-Sanchez, Barba-Aragón, and Sanz-Valle (2003) estimates the effects of training on firm effectiveness and profitability on a dataset collected from a questionnaire filled by 457 European SMEs in 1997-1998. Their findings demonstrate that training aiming to transfer specific and job-related skills impacts positively firm effectiveness but not firm profitability. They further show that on-the-job training and training offered inside the company with in-house trainers is positively associated with effectiveness and profitability. Training performed in the firm by the guidance of outside trainers is positively associated only with employee involvement in the company and quality, whereas short outdoor courses show a negative relation to profitability.

Research on employee training belongs to a larger literature which evaluates the effects

[1]Barrett and O' Connell (2001) use the concepts of general and specific training as suggested by Becker (1975) who defines general training as the type of training that increases the productivity, by equal amounts, of the firm where it was applied and of other firms, and specific training as the type of training which only increases the productivity of the firm where it was provided.

of different individual or bundles of human resource practices and assess whether they can yield better firm outcomes. Examples of such studies include the empirical paper of Koch and McGrath (1996) which tests the impact of formal training on labor productivity along with another set of human resource practices using a sample of 319 business units. Their key finding with respect to this practice shows that firms of high capital intensity that systematically train their workers tend to enjoy better productivity levels than firms that do not train their employees. Similarly, Black and Lynch (1996) test the impact of human capital investments on productivity of manufacturing and non-manufacturing firms incorporating different dimensions of employer-provided training programs including formal, computer, teamwork and supervisor training. Using establishment level data from 1993 they find that in manufacturing, the more a firm invests on off-the-job training, the more its productivity increases, whereas in non-manufacturing, investments in improving employees' computer competencies lead to higher establishment productivity levels. Additionally, Black and Lynch (2001) find that certain human resource practices such as employee participation in decision making, incentive based compensation and training are associated with higher firm productivity. They analyse a survey dataset and their main findings with respect to training reveal that when using cross-sectional data, training has a positive effect on productivity. However, when they try to account for the possible endogeneity of training by controlling for unobserved fixed effects, findings seem to be insignificant. Other studies show that a set of interrelated human resource practices such as recruitment and hiring, extensive training rather than changes in individual practices are linked not only to greater productivity outcomes (Ichniowski et al. 1997) but also to better quality in firms (MacDuffie 1995), better corporate financial performance and lower employee turnover (Huselid 1995).

In summary, previous work on the impact of training, studied individually or as interrelated human resource practices, reports positive results with some types of training including formal and general training to cause a greater effect than others. Each contributes to out better understanding of the implications of the training activity. Also,

these studies provide guidance for further research suggesting that more thorough analysis of the topic is still needed in order to address methodological challenges and identify whether the effects measured are indeed due to the training activity.

2.3 Data Description

I use data from a single company's personnel files and information extracted from face-to-face interviews with the production manager in an effort to understand the production processes and the nature of the training activity applied. In particular, the data upon which the paper is based are assembled from a family-owned company that produces confectionery and bakery products in Greece. Currently, it employs almost 350 employees in all its facilities and is one of the largest companies in the industry nationally[2]. The company owns a main production facility comprised of separate production lines operated by nearly 30 individual workers. Production workers work jointly to produce pieces of different bakery products. In particular, they form groups consisted of 3 to 5 and each group is responsible for the operation of one production line. Given that heterogeneity in production processes and outputs often limit the persuasiveness of empirical studies, I sought to minimize this problem by restricting observations to one production line. This production line consists of one machine that produces four types of non-seasonal small breads of different flavours which have similar characteristics e.g. shape and size, require analogous processing times and baking methods, and differ slightly in the making process. In the case of two out of the four small breads, one type of small bread with chocolate and one type of small bread with raisin, the production process is more automated and the ingredients are introduced before the machine starts producing the final pieces.

[2]Greece, similar to other European member states, has its own definition of what constitutes a small, medium, or a large sized enterprise. Based on the staff headcount criterion of the Hellenic Organization of Small and Medium Enterprises and Handicraft in Greece, enterprises employing fewer than 100 employees are small and medium enterprises (SMEs) and enterprises that exceed this cut-off are classified as large. The European Union uses a different threshold which categorizes companies with fewer than 250 employees as SMEs and companies with more than this number as large. Following either the Greek or the European concept, the company falls into the large company classification.

However, in the case of the other products, two types of small breads with sesame seeds, there is higher employee-product interaction because the ingredients are placed manually and each person on the line is responsible for coating the pieces with water and then sprinkling each to sesame seeds.

Below, I explain how extracting the aforementioned and additional information from the productivity records of a single firm made it possible to avoid measurement errors and deficiencies frequently observed in previous studies, as suggested mainly by Bartel (1995, 2000). First, very often studies use indirect measures of productivity such as the individual wage rates. Here, the measure of productivity is the number of pieces per minute produced by a specific machine tracked before, during, and after the receipt of training. Given the importance of working time as a component of productivity growth, studies that measure productivity not accounted for the time worked have reported less reliable results. Thus, a productivity ratio that includes what is produced and production times seem to be of great importance. The second prerequisite refers to the misrepresentation of the training duration in the data and to inaccurate definitions of different training activities applied in each firm. According to Bartel (1995) there is evidence that firms usually adopt training practices that last merely few days. Therefore, datasets which describe training duration in terms of weeks tend to misrepresent the true duration of the activity and in extension its impact on productivity. In addition, different types or different dimensions of training cause different effects on productivity as well (Barrett and O'Connell 2001). Thus, specifying the training activity adopted is very important yet sometimes overlooked. In addressing these issues, I collected information regarding the exact duration of the employee training in days, and the nature of training activity applied.

What the interview with the production and the human resource manager revealed is that at the end of 2005, the company decided to update the skills of the employees working in the production units of the factory mainly due to the increase in incidences of delay in production and defective products observed the last months. There are various reasons

that might have caused these problems starting from the orientation training period during which the employees were exposed on a wide range of machinery equipment. It might be the case that the problems in the production units, among others, arose either because the trainees received too much information during their induction within the company to be assimilated in a period of few weeks. A second explanation might be that the information transmitted to employees was too general and they never really understood the particular specifications of each machine. Therefore, when the employees were assigned to work on a specific type of machine, they failed to work at their highest potential. Another possible reason is failure to pay attention to details or the increase of careless mistakes because of the daily routine or the repetitive nature of tasks.

The main step the company followed in alleviating the delays in production, in reducing defective products, and in extension ensuring maximum productivity was to introduce training in order to improve the technical and professional skills of the employees working on machine operation and production. In particular, the employees were trained on how to set up and assemble the components of the machine, how to warm it up, and how to dismantle it properly. In addition, they were trained elaborately on how to wash each component of the equipment, how to check for missing parts by using the metal detector, and finally how to operate it according to the manufacturer's specifications. On-the-job training lasted four days and during that period the production process was not interrupted given that the training time was used to produce current output. In short, the employees were producing whilst the manager was showing them how to operate the machine properly and since the task is simple there was not any major interruption in the production process by explaining how to use the machine and how to coordinate better their activities.

Another characteristic highlighted by Bartel (2000) is the number of observations included in studies. They should cover a period enough in order to be able to draw conclusions and observe better whether employee skill acquisition and productivity gains are depreciating after some time. In this case, the initial number of observations of

daily information on worker productivity was 710 over the time period covering August 1st, 2005 until February 29th, 2006. However, valid observations fell to 686 since some cases with incomplete data dropped out of the dataset. As mentioned before, daily observations belong to the periods before, during, and after the training activity was initiated. The period after training (more than 4 months) is considered sufficient to reveal any depreciation of the training effect, since the task performed is not subject to changes and without any special complexities.

Bartel (2000) further points out a number of pitfalls encountered in existing literature that should be avoided; such as selecting high performing employees for the training program, informing the employees that their performance will be monitored after the training program, ignoring the impact of operating in a new environment, ignoring the costs of training, extrapolating findings based on a small sample of employees to a larger group. These issues are addressed in the following ways; first, since all production employees participated in the training activity, there is no selection bias. Second, the performance of employees is monitored in general as part of the daily duties of the production manager. Third, pre and post training employees are working under the same scheme in the same environment. Fourth, since employees were producing while they were receiving training, it can be claimed that there is not any significant cost resulting from the time lost on training if production was paused. Finally, although the study is based on a small sample of employees which limits the generalization of the findings, it provides a very thorough analysis of the topic which can complement findings from larger scale studies.

2.4 Measures and Empirics

Using these data, I am able to estimate the impact of on-the-job training on productivity. Output is the number or pieces produced and the input is the production time. The number of pieces produced fluctuates more (Figure 1, e.g. small bread with chocolate) than the production time (Figure 2), and the former is further driving the observed

fluctuation in productivity (Figure 3).

Figure 1. Production for Small Bread with Chocolate

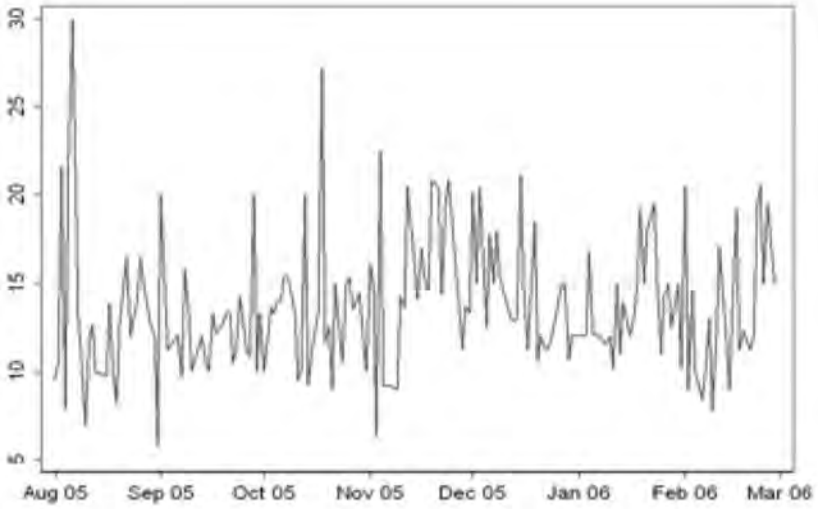


Figure 2. Production Time for Small Bread with Chocolate

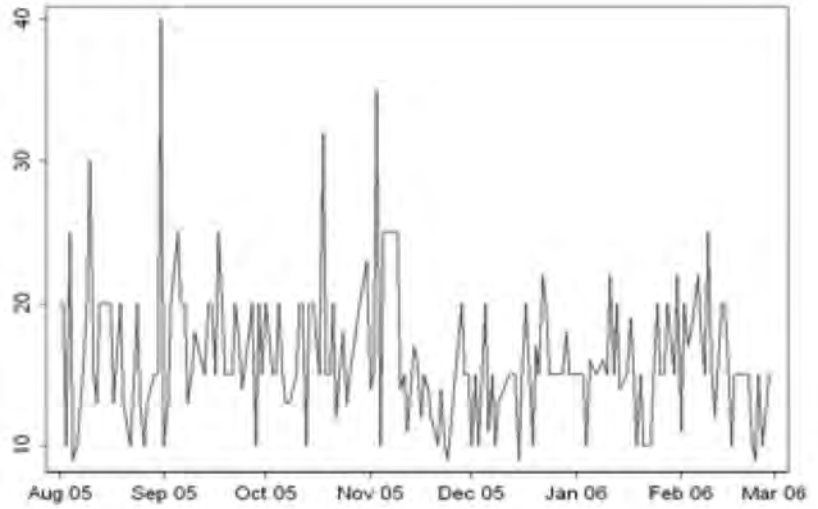
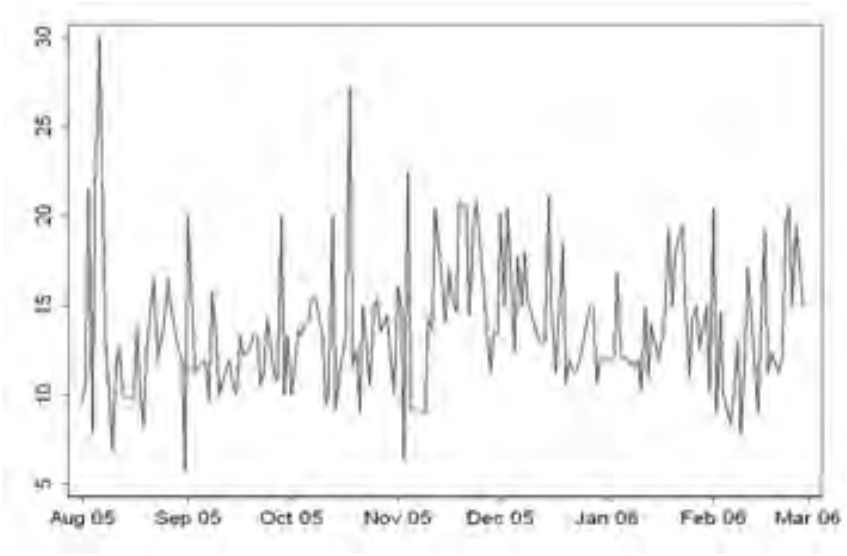


Figure 3. Productivity for Small Bread with Chocolate



Information on production and production times was recorded from the production manager who was keeping daily record of the number of pieces produced along with the beginning and ending production times. Based on this record, I measure productivity in terms of number of pieces per minute, and in the analysis its log is taken in order to observe the percentage change in productivity levels. Additional information on training comes either from the employer's reports about the number of days the workers spent on training or from the production manager's description of the training activity. On-the-job training takes the value of 1 for all the dates during and after training and 0 for all the dates before. Besides the training variable, I include a regressor for the production time which is measured in minutes and varies to a considerable extent among the four products. In the estimations that follow, I include the log of the production time along with four dummies for each product denoted as small bread chocolate, small bread raisin, small bread roll[3], and small bread sesame, which take the value of 1 when the employees

[3]For simplicity reasons, the one small bread of sesame is named small bread roll to distinguish it from the other type of small bread with sesame.

produce one of them and 0 otherwise, with the second one used as benchmark. Some data description and summary statistics are reported in Table 1, and Table 2 reports correlations. As shown, on-the-job training is positively correlated with productivity, whereas production time is negatively and very highly correlated with it. The highest correlation is observed between the small bread sesame and production time.

Table 1. Data Description and Summary Statistics

Variables	Definitions	N	Mean	Std. Dev.	Min	Max
1. Productivity	Number of pieces produced per minute	686	12.005	4.735	3.571	34.444
2. On-the-job Training	Dummy variable equal 0 before on-the-job training and 1 after on-the-job training	706	0.715	0.452	0	1
3. Production Time	Production time in minutes for all products	686	22.551	12.062	9	65
4. Small Bread Chocolate	Dummy variable equal to 1 when employees produce small bread with chocolate	706	0.249	0.433	0	1
5. Small Bread Raisin	Dummy variable equal to 1 when employees produce small bread with raisin	706	0.252	0.435	0	1
6. Small Bread Roll	Dummy variable equal to 1 when employees produce small bread with sesame (one type)	706	0.249	0.433	0	1
7. Small Bread Sesame	Dummy variable equal to 1 when employees produce small bread with sesame (second type)	706	0.249	0.433	0	1

Table 2. Correlations

Variables	1	2	3	4	5	6	7
1. Productivity	1.000						
2. On-the-job Training	0.078*	1.000					
3. Production Time	-0.760*	-0.004	1.000				
4. Small Bread Chocolate	0.210*	0.001	-0.304*	1.000			
5. Small Bread Raisin	0.412*	-0.002	-0.282*	-0.335*	1.000		
6. Small Bread Roll	0.061	0.001	-0.282*	-0.332*	-0.335*	1.000	
7. Small Bread Sesame	-0.684*	0.001	0.869*	-0.332*	-0.335*	0.332*	1.000

* $p < 0.05$

An ordinary least squares regression model is undertaken in which productivity is regressed on on-the-job training, production time, small bread chocolate, small bread roll, and small bread sesame. Consider the following equation:

$$logy_{it} = \alpha' X_{it} + \delta' Z_{it} + E_{it}$$

where y is productivity;

X_{it} is the coefficient of on-the-job training;

Z_{it} is a vector of coefficients on production time, and each product;

E_{it} is the idiosyncratic component of the error term.

Table 3 shows that the adoption of on-the-job training at the firm improves productivity by almost 6.5 percent. The coefficient of the log production time shows a negative and significant effect on productivity with a sign as expected implying that when production time increases, the effort of the employees diminishes considerably. The coefficients of all other variables turn out to be negative and significant, and depict variation in the productivity of each product. Indicatively, the coefficient of small bread sesame shows that its productivity is less by nearly 0.07 units than the productivity of small bread roll and the coefficient of small bread roll demonstrates that its productivity is less than

the productivity of small bread chocolate by 0.06 units. The R-squared of the model is almost 83 percent indicating a very high explanatory power of the betas.

Further, the baseline specification is extended by estimating the impact of on-the-job training on the productivity of each individual product using the log productivity of each small bread as the dependent variable (Log Productivity Small Bread Chocolate, Log Productivity Small Bread Raisin, Log Productivity Small Bread Roll, Log Productivity Small Bread Sesame). The models reveal that on-the-job training has a positive and significant effect on the productivity of the small bread with chocolate and both small breads with sesame (Models 2, 4, and 5), In contrast, the productivity of the small bread with raisin does not seem to be affected (Model 3). Illustratively, the results depict that a 1 percent increase in training stimulates a 5.2 increase in productivity of small bread chocolate, a 5.8 percent increase in productivity of the one type of small bread with sesame, and a 7.8 percent increase of the other type.

As mentioned in the previous section, there is a difference in the production process among the small breads with chocolate or raisin, and the small breads with sesame seeds. In the former case, the employees interact less with the products, whereas in the latter case, there is more interaction because the ingredients have to be added manually. This difference could shed light on the observed variation of the impact of training on the productivity levels among them, extrapolating employees' ability to affect more the productivity of products when there is less automation.

These results help to answer questions regarding the alignment of the impact of training on firm productivity with the financial returns resulting form that impact. This step of the analysis estimates the increase in earnings per hour of production using the estimates and the selling price of each product. The calculations show that for the small bread chocolate earnings increase by 25.68 euro per hour. In contrast, earnings for the small bread raisin slightly decrease by 0.12 euro per hour. For the small bread roll and small bread sesame, earnings increase by 21.78 and 14.94 euro per hour respectively. Notably, the significant effects found are also financially meaningful. It is also remarkable

to mention the big differences observed in the increase in earnings between the products. At this point, one can argue that an increase in financial returns could be attributed to other causes as well, however this is highly unlike given that the observed period is too short for big changes to take place and products' attributes or quality did not change.

Table 3. Estimates of Ordinary Least Squares
(Standard errors in parentheses)

Variables	Model 1 Log Productivity	Model 2 Log Productivity Small Bread Chocolate	Model 3 Log Productivity Small Bread Raisin	Model 4 Log Productivity Small Bread Roll	Model 5 Log Productivity Small Bread Sesame
On-the-job	0.064***	0.052**	-0.0002	0.058***	0.078**
Training	(0.015)	(0.026)	(0.027)	(0.017)	(0.037)
Log Production	-0.677***	-0.779***	-0.780***	-0.953***	-0.203***
Time	(0.027)	(0.042)	(0.048)	(0.034)	(0.070)
Small Bread	-0.141***				
Chocolate	(0.019)				
Small Bread	-0.198***				
Roll	(0.019)				
Small Bread	-0.261***				
Sesame	(0.031)				
Constant	4.537***	4.686***	4.868***	5.114***	2.521**
	(0.077)	(0.118)	(0.136)	(0.098)	(0.254)
Observations	686	171	173	171	171
R^2	0.826	0.685	0.613	0.833	0.063
AdjustedR^2	0.825	0.681	0.608	0.831	0.052

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

2.4.1 Alternative explanations and additional evidence of the impact of on-the-job training:

The detained data obtained help to answer other training questions. First, information on the number of days of training allow checking the extent training duration affects productivity. Second, information regarding production order, resting times, working days, and an off-the-job training activity applied in the company allow controlling for a number of other factors that may influence productivity, besides the introduction of on-the-job training. Third, information on starting and finishing production times allow estimating whether the effect of training on productivity differs depending on the length of production time. Again in this section the baseline specification is extended and results are presented below.

2.4.2 Hawthorne effect vs. Opportunity cost:

In the next step, I estimate whether productivity has improved or not during the training period in order to identify any important opportunity cost attached to it or any Hawthorne effect resulted from employees' awareness of being observed more closely during training. The Hawthorne effect, named after the Hawthorne Western Electric Plant in Illinois, alleges that any change is likely to bring about short-term gains in productivity. These gains in productivity may have been resulted because employees are receiving attention, supervision, rest pauses or because of fear of losing their job (Franke and Kaul 1978). Hence, when the workers return to the ordinary schedule, with full workdays and full workweeks, and without breaks or lunches, the productivity usually drops back to the original level. Given that during training employees are receiving attention and supervision, then according to the Hawthorne effect, these factors are expected to affect positively productivity during this period. However, an alternative perspective claims that the implementation of on-the-job training is not costless neither the productivity is unaffected. It often results to an opportunity cost of the trainer time and the lower

output of the trainee due to the worker's lack of familiarity with the job and the time devoted to training (Bishop 1997). Testing the latter effect is subject to difficulties since the direct measurement of opportunity cost is not easy to quantify precisely. Here, it is measured by estimating the productivity loss caused by training. In practice, the variable on-the-job training has been split into two dummies denoted as during training (1= during training and 0=otherwise) and after training (1= after training and 0=otherwise) in order to observe how each variable impacts productivity.

Estimations in Table 4 reveal that during training no productivity enhancing effect is observed therefore the Hawthorne effect explanation of the findings is rejected. The coefficient of the during training variable is negative and marginally significant for the whole productivity and negative and highly significant for the productivity of the small bread sesame indicating that during the implementation of the training activity, there is a very slight decrease in productivity. Thus, giving support to the opportunity cost argument. In contrast, the coefficient of after training shows that productivity is augmented by 7.3 percent. In addition, when I test the effects of after training on the productivity of each product separately, I find positive and highly significant results for all products with exception of the small bread raisin which seems not statistically significantly different from zero.

Table 4. Estimates of Ordinary Least Squares
(Standard errors in parentheses)

Variables	Model 1b Log Productivity	Model 2b Log Productivity Small Bread Chocolate	Model 3b Log Productivity Small Bread Raisin	Model 4b Log Productivity Small Bread Roll	Model 5b Log Productivity Small Bread Sesame
During Training	-0.063*	0.047	0.014	-0.029	-0.231***
	(0.034)	(0.062)	(0.065)	(0.037)	(0.078)
After Training	0.073***	0.052**	-0.001	0.064***	0.102***
	(0.015)	(0.026)	(0.027)	(0.017)	(0.035)
Log Production	-0.674***	-0.779***	-0.780***	-0.946***	-0.235***
Time	(0.026)	(0.042)	(0.048)	(0.034)	(0.067)
Small Bread	-0.141***				
Chocolate	(0.019)				
Small Bread	-0.197***				
Roll	(0.019)				
Small Bread	-0.263***				
Sesame	(0.030)				
Constant	4.528***	4.685***	4.870***	5.092***	2.639***
	(0.076)	(0.119)	(0.137)	(0.097)	(0.243)
Observations	686	171	173	171	171
R^2	0.830	0.685	0.613	0.840	0.162
AdjustedR^2	0.829	0.680	0.606	0.837	0.146

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Next, several control variables are added for production order aiming to observe whether a particular order is more efficient. Then, the amount of time between switching from the production of one product to the other measured in minutes and denoted as resting time is included. This variable is taken into consideration because the duration of resting time might affect employees' performance given that an adequate resting time

helps them to recharge and become more productive. Also, in an effort to observe if there is any temporal effect, a working day variable is added (1=Monday and 6=Saturday), denoted as day of the week. Finally, I try to capture the importance of other training activities. In particular, production employees were also trained on fire prevention and building evacuation by the guidance of an outside trainer during the sample period. I have included a control for this additional activity applied in the company, which is unrelated to the worker's main task and is denoted as during unrelated training.

Table 5, presents the estimates after entering gradually the controls. Adding these variables collectively or separately yields essentially identical results. Model 6 includes controls for the production order, and the findings reveal that only the third one (denoted as production order 3) is statistically significant at the 95% confidence interval. Model 7 adds the resting time variable which shows a positive and significant coefficient as well, whereas Model 8 controls for the day of the week[4] and its coefficient turns out not different from zero at a statistically significant level. Model 9 adds during unrelated training, the coefficient of which is insignificant, suggesting that during unrelated training, there is neither an increase nor a decrease in productivity. In Model 10 all control variables are added simultaneously observing a further consistency of the results with very minor exceptions. Once controlling for these variables, the coefficient of during training retains its negative sign and the coefficient of after training remains positive and highly significant, and thus proven consistent throughout the study.

[4]More models were estimated and the results demonstrate that the estimated coefficients for the variable measured in weeks and months are statistically insignificant.

Table 5. Estimates of Ordinary Least Squares
(Standard errors in parentheses)

Variables	Model 6 Log Productivity	Model 7 Log Productivity	Model 8 Log Productivity	Model 9 Log Productivity	Model 10 Log Productivity
During Training	-0.063*	-0.065*	-0.062*	-0.062*	-0.063*
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
After Training	0.073***	0.071***	0.072***	0.073***	0.072***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Log Production	-0.675***	-0.676***	-0.674***	-0.674***	-0.676***
Time	(0.026)	(0.026)	(0.026)	(0.027)	(0.026)
Small Bread	-0.179***	-0.165***	-0.141***	-0.141***	-0.181***
Chocolate	(0.027)	(0.022)	(0.019)	(0.019)	(0.027)
Small Bread	-0.284***	-0.189***	-0.197***	-0.197***	-0.272***
Roll	(0.076)	(0.019)	(0.019)	(0.019)	(0.077)
Small Bread	-0.357***	-0.257***	-0.263***	-0.263***	-0.352***
Sesame	(0.080)	(0.030)	(0.030)	(0.030)	(0.080)
Production	0.103				0.100
Order 1	(0.077)				(0.077)
Production	0.097				0.088
Order 2	(0.077)				(0.077)
Production	0.055**				0.033
Order 3	(0.027)				(0.032)
Resting Time		0.0002**			0.0001
		(0.0001)			(0.0001)
Day of the			-0.003		-0.003
Week			(0.004)		(0.004)

Table 5 continued

Variables	Model 6 Log Productivity	Model 7 Log Productivity	Model 8 Log Productivity	Model 9 Log Productivity	Model 10 Log Productivity
During Unrelated				0.031	0.032
Training				(0.088)	(0.087)
Constant	4.522***	4.525***	4.539***	4.528***	4.531***
	(0.076)	(0.076)	(0.077)	(0.076)	(0.077)
Observations	686	686	686	686	686
R^2	0.831	0.831	0.830	0.830	0.832
AdjustedR^2	0.829	0.829	0.828	0.828	0.829

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

2.4.3 Motivation vs. Coordination issues:

The effect of on-the-job training on productivity might be different the shorter or the longer the production time. This could be attributed to a number of factors. First, when employees produce during a longer period of time, motivation issues become more important. Usually, the efficiency of the workers is diminishing gradually and their ability of producing becomes less and less. This lies in the fact that when workers produce more, they get tired faster and then it becomes more difficult to stay focused on their work. The implementation of training might be perceived as an opportunity to improve their skills and might reflect the company's enhanced attention to them which might affect positively their motivation. Increasing their motivation will help them into keeping up with the routine of work and to be more alert during production. Second, in cases that employees produce during a shorter period of time, coordination issues become more important. When workers produce jointly, interacting and/or coordinating activities with other members become crucial. At the beginning of the production process coordination is harder but as time goes by they can keep the pace and orchestrate their activities. On-the-job training is useful in helping them to integrate, synthesize, and cooperate more

efficiently with each other, and facilitates their understanding of the importance of each individual's role.

In order to test these moderating effects, during and after training variables are interacted with production time. In model 11, the coefficient of the interaction between during training and production time is insignificant whereas the coefficient of the interaction between after training and production time is positive and highly significant, suggesting that training is more effective the longer the production time. The result implies that training contributes to motivating employees who might in return display fewer disciplinary problems, and be more likely to stay engaged with their jobs which could lead to productivity improvements. However, the coordination argument is not supported. In Model 12, having added the controls, I obtain almost identical results with a systematic positive and significant effect of the interaction between on-the-job training and production time on productivity. It is worthwhile to note that the effect of training upon labor productivity that was positive and highly statistically significant in all models becomes negative and significant, suggesting that it is the interaction between training and production time that exerts a dominant influence upon productivity rather than training on its own.

Other results not reported here include regressions with more disaggregated control variables and additional interactive terms. Instead of one dummy for the resting time variable, I have created three separated dummies; one if resting time is up to 10 minutes, one for resting time between 11 and 120 minutes (used as benchmark), and one for resting time that exceeds that threshold, indicating that resting time of small duration is more likely to be short breaks between productions whereas resting time of higher duration is more likely to signify that employees are working on something else. Results show that only the coefficient of resting time up to 10 minutes is negative and marginally significant implying that when employees have short breaks, productivity is decreasing. However, the variable loses significance when I control for other factors. Finally, resting time is interacted with the training variables, but none of the interactions is significant.

Table 6. Estimates of Ordinary Least Squares with Interactions (Standard errors in parentheses)

Variables	Model 11 Log Productivity	Model 12 Log Productivity
During Training	0.049	0.045
	(0.079)	(0.079)
After Training	-0.064**	-0.063**
	(0.030)	(0.030)
Log Production Time	-0.770***	-0.771***
	(0.032)	(0.032)
Small Bread Chocolate	-0.142***	-0.182***
	(0.018)	(0.026)
Small Bread Roll	-0.196***	-0.278***
	(0.018)	(0.075)
Small Bread Sesame	-0.274***	-0.360***
	(0.030)	(0.078)
During Training × Production Time	-0.005	-0.005
	(0.003)	(0.003)
After Training × Production Time	0.006***	0.006***
	(0.001)	(0.001)
Production Order 1		0.097
		(0.075)
Production Order 2		0.094
		(0.075)
Production Order 3		0.042
		(0.031)
Resting Time		0.000
		(0.000)
Day of the Week		-0.003
		(0.004)

Table 6 continued

Variables	Model 11 Log Productivity	Model 12 Log Productivity
During Unrelated Training		0.030
		(0.085)
Constant	4.820***	4.821***
	(0.094)	(0.095)
Observations	686	686
R^2	0.840	0.840
AdjustedR^2	0.837	0.837

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

2.5 Conclusions and Discussion

To sum up, the main predictions of the study show that the company obtains an almost 6.5 percent improvement in productivity by introducing on-the-job training as well as a considerable increase in earnings per hour of production. Though, when the effect of on-the-job training on firm productivity is estimated separately for each product, the output indicates that the impact is not significant for all products. The most probable explanation for the variation in the effects can be attributed to the employees' ability to affect more the productivity of products when there is more interaction among them and less the productivity of products which require more automation. When testing the differential effects of during and after training, estimates reject the Hawthorne effect and give support to the opportunity cost argument.

In contrast, after training seems to augment productivity by almost 7.3 percent. Also, when testing for the differential effect of training the shorter or the longer the production time, training does not seem to make a difference when employees produce for a shorter period of time, but it rather seems to be more effective when production time is longer, thus giving support to the motivation argument. The addition of the control variables

shows that the training effect remains unchanged, providing more credential to the main results of the study.

The size of the effect found is relatively large given that the training activity lasted only few days and with very limited employer cost. Results though are very difficult to compare because research in the field is very heterogeneous and there is an apparent variability in the datasets, training activities, productivity, and performance measures. Thus, a word of caution is needed when paralleling results of previous studies. For instance, Bartel (1994) found that the implementation of formal training improved productivity by 6% each year (between 1983 and 1986). Bartel (1995) showed that each day of training increased employees' wages by 1.8 percent (wages were used as proxy for employee productivity). Also, one of the interesting findings of Barrett and O' Connell (2001) revealed that general training led to a 3.4 percent productivity growth while specific training had no statistically significant impact.

The study emphasizes that selecting the right data plays a very important factor in this type of research and claims that focusing on the operations of a single firm can help researchers evading important biases resulting from vague information on training, or absence of actual productivity measures. It also shows that extracting daily data and not snapshots of a firm's situation provides the possibility to monitor the firm over some time, and observe how changes in productivity can be related to the implementation of on-the-job training. In addition, given that the study is focused on precise training definitions and duration in days, as well as a very accurate productivity measure, it can be claimed that there are not uncertainties as to whether the main results may be driven by factors that was not possible to observe. Besides that, direct contact with the production manager at the production site allowed investigating in depth whether there are other reasons that could have affected productivity. It also provided the possibility to understand the motives that led the company to apply on-the-job training to other types of training activities. In synopsis, the main explanation attained is that on-the-job training causes a faster impact on productivity when the task is very simple and

uncomplicated.

One major limitation stemming from this paper is that the findings attained are difficult to generalize to other companies. Though, they can still provide guidance to companies that have similar production processes and give an insight of the different effects of training when employees produce manually or use more automation, and for shorter or longer production times. Despite the limitations and as other authors have suggested (e.g. Bartel 2000), researchers should be encouraged to gain access to firm's records and collect information on variables necessary to isolate the effect of training.

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Chapter 3

High Performance Work Practices, Work Uncertainty, and Employee Overtime. The Other Side of the Story.

3.1 Introduction

Prior work has consistently demonstrated that the implementation of high performance work practices (HPWP) such as participatory mechanisms, skill-based rewards, rotation schemes, and training systems positively affect labor productivity (Arthur 1994; Koch and McGrath 1996; Ichniowski, Shaw, and Prennushi 1997), financial performance (Huselid 1995; Huselid, Jackson, and Schuler 1997), or employee retention (Guthrie 2001). Despite the consensus among scholars that these practices yield positive results, the empirical examination of whether the benefits come to employee at the expense of work intensification is scarce. As it appears, HPWP increase effectiveness by creating conditions where employees become highly involved in the firm and work hard to achieve its goals (Arthur, 1994; Wood and de Menezes 1998). However, one of the main problems

in this research stream, and particularly in previous work on the impact on productivity, emanates from whether studies take into account the possible changes in employee working time as a result of higher involvement and work effort, when estimate the effects of human resource practices. In fact, the effects might be overestimated if the impact of HPWP on performance is tested without taking into consideration the increase in costs due to overtime.

To reverse position, a small number of studies focus on this issue conjecturing that HPWP have been a notable influence on effort or work intensification, with the terms sometimes used interchangeably (Ramsay, Scholaries, and Harley 2000; Godard 2001; Green 2004). Specifically, their presumption is that the performance gains from human resources practices might arise from work intensification which may manifest itself mainly in two different dimensions; either by employees exerting greater work effort during a given period of time or by employees staying longer hours at work. However, empirically basic hypothesis concerning the implications for the latter has generally not been tested. As it appears, there is scarcity of data availability on effort and much of the measures on work intensification are in a subjective form of work effort, while spending longer hours at work as a more objective measure has been highly neglected.

Aiming at filling this gap, the study draws on the perspective which focuses on how HPWP are related to work intensification in the form of longer working hours. A positive relationship is hypothesized. This is not an obvious issue because there is the alternative perspective which emphasizes the capacity of HPWP to prepare employees to work more efficiently, and thus suggests the opposite relationship. It is also important to understand that there are other significant factors contributing to work intensification. Among them, previous literature suggests that work intensification is the consequence of exogenous changes that reflect disruptions or uncertainty (Godard 2001). Thus, the study estimates that uncertainty at work could be also driving some of the employee overtime, and takes a step further arguing that this positive relationship could be mediated by the implementation of HPWP. The reasoning behind this hypothesis lies on previous theo-

retical work which has highlighted the capacity of human resource practices to facilitate a firm's ability to adapt effectively to changing demands, from either the environment or from within the firm itself (Milliman, Von Glinow, and Nathan 1991; Snow and Snell 1993; MacDuffie 1995). According to that perspective, when there is uncertainty, introducing various HPWP helps employees to become more flexible in the organization of work and better acclimatize to uncertain and dynamic environments. These arguments point out the importance of examining the mediating role of these practices, and thus the final step tests how exactly these transmit the effects of uncertainty to employee overtime.

In essence, the current approach departs from previous literature mainly in the following aspects. First, it attempts to determine whether HPWP are related to employee overtime as an objective measure of work intensification. This is an important contribution for two reasons. First, working longer hours at work might be driven by the introduction of HPWP, however prior work has given scant attention. Second, overtime as a measure of work intensification has not been studied in this context. Finally, the paper produces an integrative multiple mediation model which advances previous literature by addressing how different HPWP may transmit the effects of uncertainty on employee overtime. If it is accepted that this has been an era of work intensification, then a better knowledge of possible sources of work intensification contribute to our knowledge of this phenomenon.

Hypotheses are tested using the European Working Conditions Survey (EWCS) of 2005. This survey aims at providing an analysis of working conditions of nearly 30,000 individual workers in thirty one European countries. This is an important context to study the relationships of interest because many European firms have started introducing HPWP, in a moment where a rise in the work intensity figures has been noticed (Green 2001; Green and McIntosh 2001; Green 2004), and employee overtime remains a significant issue across Europe (EIRO 2003).

3.2 Previous Research

Three streams of literature are relevant to this study: the human resource management literature on high-performance work practices, the literature on overtime, and the work intensification literature.

Papers on the former literature focus extensively on the impact of human resource practices on different performance outcomes. However, the majority of them do not have sufficient data to account for possible changes in employee working time resulted from the introduction of such practices and in particular, measures of productivity often do not account for hours worked. For example, Huselid (1995) examines the link between human resource practices and various employee outcomes such as employee turnover, productivity, and short-term and long-term measures of corporate financial performance. He measures turnover with the average annual rate of turnover, firm productivity with the logarithm of sales per employee, financial performance with the logarithm of Tobin's q, and the gross rate of return on capital. Koch and McGrath (1996) study the effects of human resource planning, recruitment, and selection strategies on labor productivity. In this case, productivity is measured by dividing the business unit's net sales by the number of employees, thus comparing the input of labor to the output of sales. Black and Lynch (1996) examine the impact of human capital investments, including age and certain types of employer-provided training, on business productivity proxied by the dollar value of sales. Black and Lynch (2001) show how workplace practices, and information technology affect productivity levels measured by the sales per production worker. Guthrie (2001) tests how the use of such practices impacts both firm productivity and employee retention. Labor productivity is the logarithm of sales per employee, and employee retention is measured as the firm's average annual rate of employee turnover. There are, however, few exceptions which directly or indirectly take into consideration working time. MacDuffie (1995) studies the effect of a system of human resource practices on labor productivity. Labor productivity is defined as the number of hours of working effort required to build a production unit (a vehicle). Also, the studies of Ichniowski et al. (1997) and Ichniowski

and Shaw (1999) investigate the productivity effects of various practices such as incentive pay, teams, and training, and measure productivity with uptime claiming that increases in uptime are increases in tonnage and productivity.

Papers on the overtime literature identify key drivers of overtime by looking mainly at wages, unionization, employee absenteeism, or differences in employee skills. However, human resource practices could be also associated with the overtime incidence, yet they are ignored. For instance, Ehrenberg (1970) argues that absenteeism is one of the causes that could increase the amount of overtime worked per employee. Bauer and Zimmermann (1999) suggest that the employee skill levels and output growth play an important role on overtime, whereas compensation for overtime has become less relevant. Doerr, Klastorin, and Magazine (2000) infer that overtime is of significance when manufacturing to a quota, and point out that when working times are highly variable, overtime is a better alternative than hiring additional workers. Finally, the paper by Kalwij, and Gregory (2005) suggests that a reduction in standard weekly hours increases overtime work, an increase in the wage rate decreases the incidence of overtime, and union coverage appears to be of negligible importance.

Finally, studies on the work intensification identify that human resource practices are important sources of work intensification. Nevertheless, they focus almost exclusively on the subjective nature of the effort-intensification data or use proxies for work effort. Such measures include the extent to which job involves working at high speed or a great deal of tension (Green 2004) as well the extent of workload and work stressfulness (Godard 2001). Papers in this stream of literature include Ramsay et al. (2000) who study the relationship of an inclusive set of twenty four human resource practices (e.g. performance related pay, training, recruitment and selection, teamwork), and a number of intermediate outcomes including the intensification at work and job strain which act as mediators of various performance outcomes. In their paper, work intensification is defined as subjective management reports of the observed change in labor productivity, while job strain is defined as the perception of not having enough time to get the job done or as being

worried about work outside working hours. Their findings suggest that in work environments where these practices have been applied, management does perceive increased work intensification and job strain. Similarly, the work of Godard (2001) examines the positive and the negative implications of the adoption of human resource practices inferring that one of the negative employee outcomes is work intensification. Here, work intensification is defined as workload and work stressfulness. His results suggest that human resource practices appear to be associated only with the work stressfulness measure of work intensification. The study of Green (2004) also hypothesizes that work intensification has been stimulated, among others, by the implementation of human resource practices. In particular, he proposes that employee involvement schemes and effort incentives appear to engender work intensification. Again, work intensification is measured through subjective reports on a survey question about changes in workplace regarding how hard people work at their job.

In summary, although there has been considerable research assessing the implication of human resources practices on different outcomes, previous studies in this line of research have largely ignored the importance of changes in working time caused by the introduction of such practices. In addition, the high performance thesis underpinning the benefits of the adoption of these practices has been developed at a time work has been severely intensified. This has meant that scholars were encouraged to search alternative trajectories through which human resource practices could be studied. However, previous research on the work intensification literature has only recently begun to address the implications of human resource practices to work intensification and to a large extent has mostly relied on the subjective nature of the effort-intensification data; while, the incidence of overtime is not studied in this context.

3.3 Hypotheses

I examine two theoretical approaches, work efficiency vs. work intensification. One focuses on the relationship between HPWP and employee efficiency, whereas the other is paying attention to the link between these practices and employee overtime.

The literature on human resource practices argues that employees are introduced to various techniques concerning training, teamwork, job design, and many others aiming at eliciting optimal performance. There is ample evidence which shows strong support for the conclusion that these practices are indeed a cause of improved performance, and that is why the literature often refers to them as HPWP (Huselid, 1995; Delaney and Huselid 1996; Guest 1997). HPWP are designed to stimulate greater involvement and commitment in the firm (Snell and Dean 1992; MacDuffie 1995; Youndt et al. 1996; Ichniowski et al. 1997). It is either explicit or implicit that greater commitment induces workers to increase work effort and encourages them to identify with the goals of the organization and work hard to accomplish them (Arthur 1994; Wood and de Menezes 1998). According to this perspective, high-effort actions helps them to work somehow smarter by getting them to work actively which will eventually lead to increased efficiencies in processes and firm productivity.

For example, training is considered a very powerful mechanism that engenders a productivity enhancing response from the employee (Bartel 1994; 1995; Bartel, Ichniowski, and Shaw 2004), and job rotation develops abilities and directs employees' efforts in meeting production needs in case of reallocation across different tasks (Eriksson and Ortega 2006). Economic incentives and jobs with performance-related pay induce workers to exert greater effort and achieve substantial gains in productivity because in return they expect their efforts to be fairly rewarded (Ichniowski 1986; Ichniowski et al. 1997). Furthermore, teamwork is expected to increase production possibilities by using collaborative skills and information sharing that aid in transferring idiosyncratic knowledge from one team member to another (Lazear 1998; Hamilton, Nickerson, and Owan 2003). Also, there is growing evidence supporting that employee participation not only enhances

individual knowledge but also increases effort which subsequently improves efficiency and productivity, reduces the cost of monitoring employees and leads to increased commitment (Doucouliagos, 1995) and improved firm performance (Osterman 1995; Ortega 2009a).

However, creating conditions where employees have to be more involved in their job and work harder to achieve certain goals sometimes might cause adverse results (Ramsay et al. 2000; Green 2004). There are perceptions suggesting that although the implementation of HPWP leads to work efficiency, it may also have negative consequences, particularly on the quality of employee working life. Previous research assesses the implications of these practices on negative experiences at work such as greater tension, insufficient time to perform tasks, and missed deadlines (see more in Godard 2001; White et al. 2003). However, there is limited insight into the implications of HPWP on extra-work outcomes. The practices might increase the number of additional hours worked in order to reach expected outcomes. Thus, it seems plausible that these practices are driving employee overtime to the extent that they are designed to evince greater effort and involvement in pursuit of the organization's goals. Scholars' discussions directly address the issue of increased effort or harder work but do not directly review employer practices that exert pressure to work longer hours and end up in working overtime; though it is natural to inquire that this might be the case.

For example, training schemes could boost employee overtime due to the time employees have to spend in learning as opposed to those engaged in actual production (Carrillo and Gaimon 2004). Similarly, the benefits attributed to rotation schemes come at a cost of increased workload levels (Campion, Cheraskins and Stevens 1994). This is the case because employees might need considerable adaptation time to perform well in new assignments or adjust to the job requirements of each rotated position. Incentive pay seems also to be associated with longer hours at work mainly because it affects work effort hours and those who work hard might be rewarded with a pay increase (Bell and Freeman 2001). Also, employee discretion can aggravate employee overtime because it

designates less assistance at work and more individual responsibility. For instance, higher employee participation often implies greater involvement of non-managerial employees in decisions previously left to the discretion of managers (Gittleman, Horrigan, and Joyce 1998). This shift in responsibility despite of causing productivity gains could also involve an offloading of tasks leading to employee overtime.

HPWP are likely to have a larger effect on performance when implemented synergistically rather than in a vacuum because they can interact to reinforce one another (MacDuffie 1995; Huselid 1995; Ichniowski et al. 1996; Becker and Huselid 1998; Wood 1999; Ichniowski and Shaw 1999). For instance, the returns from the use of internal selection procedures are likely to be greater when a firm applies a performance appraisal system and an incentive plan to reward high performing employees. Also, a strong incentive system to retain employees in the firm can magnify the results from investments in employee training. The benefits stemming from the adoption of bundles again are residing to the creation of the appropriate circumstances where employees become more involved in the organization (Arthur, 1994; Wood and de Menezes, 1998; Whitener 2001); such as by participating in managerial decisions, while getting involved with developmental programs and incentive plans. Though, as a result of higher involvement, bundles could lead directly or indirectly to work intensification conjecturing that HPWP jointly adopted may actually be linked to performance through work intensification. In fact, previous work has found that bundles of practices are associated with increased effort such as job strain, off-loading of tasks, and work intensification as a potential explanatory for negative experience (Ramsay et al. 2000) as well as harder work (Ichniowski and Shaw 2003). Thus, we might well expect their combined effects to further amplify their association to employee overtime at higher levels of adoption. In short, if employees have to be ready to solve problems promptly while participating continuously in decision making, or attending training and development programs, then they might have to exert more effort that could take the form of extra working time as a result of higher involvement, added responsibility, and higher job demands. Taking these arguments into

account, then it is expected:

Hypothesis 1a. Individual high performance work practices will be positively related to employee overtime.

Hypothesis 1b. The positive relationship of high performance work practices and employee overtime will be stronger when practices are adopted in combination.

Theoretical work suggests that work intensification could be the outcome of process changes through the addition of new technologies, organizational changes (Green 2004) and increased competitive pressures being passed on to workers (Burchell et al. 1999). Some of these changes tend to increase the plant's effective capacity, such as by reducing setup times as a driver of firm performance (Spence and Porteus 1987). But mainly they tend to raise work effort because they seem to be associated with greater managerial control over the labour process which is likely to bring higher effort levels (Green 2004). At the same time, these factors are characterized by a great level of uncertainty. Frequently, technological change are accompanied by technical problems which lead to production disruptions or excessive idle time, the result of which might be smaller-than-expected gain in the plant's effective capacity which can reduce ultimate performance gains. In such cases, costly measures are needed in order to increase performance such as expediting or overtime (Pisano 1996; Cohen and Apte 1997; Davenport 1998). Second, uncertainty is associated with competitive pressures as well because these mechanisms might lead to abrupt and unexpected increases in demand. Overtime work, then, appears as a mechanism to adjust the firm's capacity to production requirements. The incidence of overtime can increase a firm's capacity directly in an effort to cover increased production requirements by increasing the number of hours worked (Spence and Porteus 1987). Another source of uncertainty derived from these forces involves scheduling changes introduced in order to avoid bottleneck workstation problems (Pisano 1996; Cohen and Apte 1997;

Davenport 1998). Scheduling changes inevitably involve a certain level of uncertainty which might raise the potential of work done outside normal working hours. Thus, it is expected that work uncertainty resulting from different types of changes is positive related to employee overtime. Stated formally:

Hypothesis 2. Work uncertainty will be positively related to employee overtime.

Hypotheses 1 and 2 offer insight into two alternative drivers of employee overtime. The effect of each of these two factors, however, cannot be fully understood in isolation from the other. An important part of the overtime story concerns the fact that employees are introduced to HPWP possibly with the objective of creating a more positive environment and help employees coping with uncertainty at work. As previous work suggests, HPWP improve employee skills, and are expected to prepare employees to deal better with technical problems or to confront changes at work when they arise. In particular, investing in worker knowledge such as by engaging employees in training has been claimed to attenuate some of the outcome uncertainty of process change and further enhance the magnitude of gain in performance (Cohen and Levinthal 1990; Adler and Clark 1991; Pisano 1996; Schroeder, Bates, and Junttila 2002; Carrillo and Gaimon 2004).

Although previous work explicitly recognizes the importance of these practices in coping with uncertainty in an effort to achieve performance gains, it has not examined the consequences of introducing HPWP in terms of amplifying overtime work. Following the arguments stated in hypothesis 1, and taking into account that HPWP are frequently introduced as a response to uncertainty, it is then expected that they will act as mediating mechanisms between uncertainty and employee overtime. More explicitly, as discussed previously, uncertainty is associated with employee overtime, and HPWP can be used in order to mitigate the negative consequences of uncertainty but usually on performance. In contrast, in this study, I have argued that HPWP may amplify the relationship between uncertainty and overtime because they are very likely to be related to overtime as well.

Therefore, I expect that one way uncertainty is related to employee overtime is through these practices, and due to their own independent relationship to overtime, I suggest a partial mediated model. Accordingly:

Hypothesis 3. HPWP will partially mediate the positive relationship between work uncertainty and employee overtime.

3.4 Data and Measures

The main source of data is the European Working Conditions Survey (EWCS) carried out in 2005 by the European Foundation for the Improvement of Living and Working Conditions. The survey is designed to present a detailed analysis of various aspects of working life across the European Union, the two candidate countries Turkey and Croatia, as well as Switzerland and Norway, and provide insights into emerging themes and specific practices applied. It is based on self-reports of nearly 30,000 individual workers, however since the paper studies HPWP such as teamwork and rotation, self-employed individuals had to be excluded.

Unlike previous literature which has focused on subjective measures of work intensification, here it is elaborated a more objective measure as a dependent variable, defined as overtime. This is a count variable assessed using a question that asks how many times a month does an employee work more than 10 hours a day. For the majority of individuals this is zero, but for the remainder values typically reach as many as thirty with some observations reaching thirty one (see Table 1 for definitions and Table 2 for summary statistics). Regarding HPWP, according to the literature, conceptually they can be classified in terms of their impact on employees' skills, motivation, and the way the work is structured (Huselid 1995; MacDuffie 1995; Delaney and Huselid 1996). The questionnaire contains very detailed information pertaining to each category out of which seven main explanatory variables have been constructed; training, task rotation, productivity pay, gain sharing, teamwork, employee discretion over methods, and employee discretion over

schedule. All of them measure the respondent's participation in each practice, rather than the frequency of those practices at the organizational level.

Training and task rotation refer to employee skills. The former is constructed out of four different types of training = (training paid by the employer + training paid by the employee + on-the-job training + other forms of training)/4. The latter is examined by using a dichotomous (yes/no) question that asks if an employee's job involves rotating tasks between himself/herself and colleagues. The next two variables, productivity pay and gain sharing refer to employee motivation. Both are measured dichotomously with questions that ask whether employee remuneration includes payments based on the overall performance, and whether he/she receives productivity piece rate or productivity payments. Further, teamwork and the employee discretion variables refer to the structure of work. Teamwork is measured dichotomously and depicts whether an employee's job involves doing all or part of his/her work in a team. The first type of discretion is based on three items referring to employee autonomy to choose or change the order of tasks, the method of work, and the speed or rate of work and is defined as discretion over methods = (task order + work methods + work speed)/3. Similarly is evaluated the second type of discretion defined as discretion over schedule and focuses on three items referring to employee autonomy to choose breaks, decide when to take holidays, and choose among different working time arrangements (see more in Ortega 2009b).

In order to test hypothesis 1b, I have created a bundle out of the aforementioned practices. Here, training is operated via four items, and discretion mechanisms via the six discretion practices, and along with task rotation, productivity pay, gain sharing, and teamwork give a total of fourteen practices bundled together. To measure it, I use the additive approach following MacDuffie (1995) which allows for a less restrictive bundling of human resource practices. MacDuffie suggests that the summation in the additive approach keeps normal distribution and it is a less rigid criterion for a bundle than the multiplicative approach, especially when a certain practice does not exist. All items have been standardized to have a 0 mean and a standard deviation equal to 1 before I

construct the indexes[1].

The work uncertainty can be expressed along different dimensions. For the purpose of this paper, the focus has been placed on task interruptions and changes on employee's schedule. The first item, defined as task uncertainty, measures how often does an employee have to interrupt a task he/she is doing in order to take on an unforeseen task, and is expressed at a 4-point scale (never, 0, to yes, very often, 3). The second item, defined as schedule uncertainty, measures whether changes in schedule occur regularly and if yes, how long before the employee is informed about the changes. Responses for this item have a 5-point response format (no, 0, to yes, the same day, 4). Given that there is no direct measure in the survey to account for shifts in supply, the latter variable could also serve as a proxy, inferring that schedule modifications are usually taking place when an employee has to work more hours rather than less hours in an effort to meet unexpected job demands.

To capture individual, firm, and contextual factors that might be related to both the implementation of HPWP, performance, and employee overtime, I have taken into consideration several control variables. Drawing on prior research, I initially control for gender differences because the increase in effort has been somewhat greater for women than men (Green 2004). Then, I control for age as a proxy for work experience (Dokko, Wilk, and Rothbard 2009), tenure as a proxy for ability (Ortega 2009a), and the educational level of employees as a proxy for learning ability (Cappelli 2004). I also employ controls for work status (full-time or part-time) and the type of employment contract, since both are likely to affect effort levels and subsequently performance. For example, employees in a temporary position might devote extra effort if they aim to be reemployed in preceding periods. The opposite reaction is also plausible since the employee temporary condition

[1]For training, discretion over methods, discretion over schedule and bundle, Cronbach's alpha are 0.56, 0.75, 0.62, and 0.66 respectively. I also use other constructs to measure each index. The former variable takes 1 in case of having received any of the four training activities and 0 otherwise. Discretion over methods takes 1 in case of employees having autonomy in any of the 3 practices and 0 otherwise. In the same way is constructed the discretion over schedule index. And the alternative constructed index for the bundle measures whether employees are involved in any 5 out of the seven individual HPWP.

might generate demoralization and might reduce incentives and their willingness to invest effort at work (Green 2004). I include controls for the number of employees under each employee's supervision, and employee occupation which are also expected to have some association with employee effort (Green and McIntosh 2001). Firm size is very important as well because larger firms may be more likely to adopt HPWP (Osterman 1994; Gittleman et al. 1998), and therefore I control for it. I also add controls for sector because previous research claims that public sector has experienced greater effort intensification than the private sector (Green 2004). Finally, I add a number of controls for industry representing two-digit Standard Industrial Classification (SIC), and countries in order to capture any other industry and contextual characteristics associated with performance perceptions.

Table 1. Definitions of Variables

Variables	Questions and definitions
Overtime	How many times a month do you work more than 10 hours a day?
Training	Have you undergone: training paid for or provided by your employer or by yourself if you are self-employed? -training paid for by yourself? -on-the-job training (co-workers, supervisors)? -other forms of on-site training and learning (e.g. self-learning, on-line, tutorials etc)?
Task rotation	Does your job involve rotating tasks between yourself and colleagues?
Productivity pay	Does your remuneration include piece rate or productivity payments?
Gain sharing	Does your remuneration include payments based on the overall performance of the company (profit sharing scheme) where you work?
Teamwork	Does your job involve doing all or part of your work in a team?
Discretion over methods	Are you able, or not, to choose or change your order of tasks? -your methods of work? -your speed or rate of work?
Discretion over schedule	Can you take your break when you wish? -are you free to decide when to take holidays or days off? -how are your working time arrangements set?
Task uncertainty	How often do you have to interrupt a task you are doing in order to take on an unforseen task?
Schedule uncertainty	Do changes to your work schedule occur regularly? (IF YES) How long before are you informed about these changes?
Male	Gender

Table 1 continued

Age	Years of age
Tenure	How many years have you been in your company or organization? If less than a year, how many months?
Education	What is the highest level of education or training that you have successfully completed? One digit ISCED code
Fulltime	Work status
Contract	What kind of employment contract do you have (indefinite contract, fixed term contract, temporary employment agency contract, apprenticeship or other training scheme, no contract or other)?
Supervision	How many people work under your supervision, for whom pay increases, bonuses or promotion depend directly on you?
Occupation	One-digit ISCO-88 occupation
Firm size	How many people in total work in the local unit of the establishment where you work?
Public	Sector
Industry	One-digit NACE industry
Country	Country of interview

Scales: Overtime is 0-31, task uncertainty is 0-3, schedule uncertainty is 0-4, age, tenure ure, education, supervision are continues, firm size is 0 = 2-4 individuals, 1 = 5-9, 2 = 10-49, 3 = 50-99, 4 =100-249, 5 = 250-499, 6 = 500 and over (interviewee works alone is excluded from the sample). For all othervariables the scale is 0 = no, 1 = yes.

Table 2. Summary Statistics

Variables	N	Mean	Std. Dev	Min	Max
1. Overtime	24,853	2.818	5.818	0	31
2. Training by employer	25,573	0.306	0.461	0	1
3. Training by employee	25,572	0.069	0.253	0	1
4. On-the-job training	25,545	0.322	0.467	0	1
5. Other forms of training	25,526	0.215	0.411	0	1
6. Task rotation	25,435	0.501	0.500	0	1
7. Productivity pay	22,723	0.120	0.325	0	1
8. Gain sharing	22,630	0.086	0.280	0	1
9. Teamwork	25,441	0.648	0.478	0	1
10. Task order	25,479	0.640	0.480	0	1
11. Work methods	25,457	0.668	0.471	0	1
12. Work speed	25,386	0.703	0.457	0	1
13. Breaks	25,458	2.039	1.580	0	4
14. Days off	25,259	2.161	1.548	0	4
15. Time arrangements	25,519	0.756	1.091	0	3
16. Task uncertainty	25,491	1.270	0.984	0	3
17. Schedule uncertainty	17,880	0.771	1.334	0	4

3.5 Resutls

Before presenting the results of the estimation of equations, I report in Table 3 correlations on the sample of employees. The correlation coefficients give a first impression of the hypothesized relationships between the regressors and the regresand. All are positively related to overtime, while employer training, on-the-job training, and days off do not seem to be related to it.

Table 3. Correlations

Variables	1	2	3	4	5	6	7	8	9
1. Overtime	1.00								
2. Training by employer	0.01	1.00							
3. Training by employee	0.05*	0.12*	1.00						
4. On-the-job training	-0.003	0.36*	0.07*	1.00					
5. Other forms of training	0.03*	0.27*	0.15*	0.38*	1.00				
6. Task rotation	0.04*	0.10*	0.02*	0.12*	0.07*	1.00			
7. Productivity pay	0.06*	-0.03*	-0.02*	0.01	-0.02*	0.002	1.00		
8. Gain sharing	0.05*	0.10*	-0.01	0.09*	0.08*	0.04*	0.10*	1.00	
9. Teamwork	0.05*	0.12*	0.03*	0.15*	0.10*	0.37*	0.02*	0.05*	1.00
10. Task order	0.04*	0.14*	0.07*	0.06*	0.12*	0.02*	-0.07*	0.06*	0.01
11. Work methods	0.05*	0.13*	0.07*	0.06*	0.12*	0.02*	-0.05*	0.05*	0.02*
12. Work speed	0.04*	0.07*	0.05*	0.02*	0.08*	0.02*	-0.01	0.04*	-0.00
13. Breaks	0.07*	0.07*	0.01*	0.01	0.05*	-0.04*	-0.01	0.11*	-0.04*
14. Days off	-0.01	0.08*	0.003	0.04*	0.04*	0.01	-0.02*	0.10*	0.01
15. Time arrangements	0.19*	0.08*	0.05*	0.01*	0.06*	-0.02*	0.00	0.13*	-0.03*
16. Task uncertainty	0.07*	0.18*	0.04*	0.13*	0.12*	0.17*	-0.06*	0.06*	0.15*
17. Schedule uncertainty	0.15*	0.03*	0.02*	0.06*	0.02*	0.10*	0.07*	0.02*	0.07*
	12	13	14	15	16	17	18	19	
10. Task order	1.00								
11. Work methods	0.56*	1.00							
12. Work speed	0.45*	0.48*	1.00						
13. Breaks	0.34*	0.26*	0.28*	1.00					
14. Days off	0.20*	0.14*	0.16*	0.41*	1.00				
15. Time arrangements	0.29*	0.25*	0.20*	0.39*	0.29*	1.00			
16. Task uncertainty	0.19*	0.16*	0.07*	0.11*	0.06*	0.13	1.00		
17. Schedule uncertainty	-0.04	-0.02*	-0.04*	-0.04*	-0.07*	0.10	0.11	1.00	

* $p < 0.05$

As a next step, I conduct preliminary analysis in order to assess the difference in approaches to overdisperion observed in the count outcome variable with a mean much lower than the variance (μ=2.818, var= 33.846), without considering any covariates. Ordinary Poisson regression underestimates the standard errors therefore alternatively

I use a negative binomial regression for modeling the overdispersion. The dependent variable is the count of overtime, y_i which depends on observed X_{ik} and unobserved u_i variables. Considering that count variable, y_i has a negative binomial distribution, then I specify the model as such:

$$\begin{aligned} y_i &\sim Negbin(\mu_i, \sigma_y^2), i = 1, 2, \ldots, n \\ \log \mu_i &= \sum_{k=1}^{K} \beta_k X_{ik} + u_i, \quad k = 1, 2, ..., K \end{aligned} \tag{3.1}$$

where $\mu_i = E\{y_i | x_i\}, \sigma_y^2 = Var\{y_i | x_i\}$, X_{ik} is $n \times K$ dimensional matrix, indicating the number of independent variables (training, task rotation, productivity pay, gain sharing, teamwork, discretion over methods, discretion over schedule). The controls are introduced into all regressions in order to take into account the possible heterogeneity attached to individual and firm characteristics that might be related to overtime, apart from its association with the main explanatory variables.

Table 4 presents the overall results by introducing gradually the main explanatory variables of the study. Model 1 contains the individual HPWP and indicates that coefficients are positive and significant in most of them. Particularly, training, task rotation, productivity pay, and teamwork seem to be positively and highly significantly related to overtime, while gain sharing, discretion over methods and schedule although positive do not seem to differ from zero at a statistical significant level. Thus, lending evidence to hypothesis 1a which supports that individual HPWP will be positively associated with employee overtime. Model 2 tests the potential association between complementary HPWP and overtime. Here, the human resource (HR) bundle and the HR bundle^2 enter into the regression. The individual practices had to be excluded because of multicollinearity problems[2]. The coefficients turn out to be positive and highly significant, yielding support for Hypothesis 1b which predicts that the positive relationship of HPWP and

[2]I re-estimated the equation but substituted the bundle with the individual HPWP. The association of the dependent variable with the training, task rotation, productivity pay, teamwork and the bundle8 appear to be significantly positive.

employee overtime will be stronger when practices are adopted in combination.

Moving forward with the analysis, I examine the relationship between work uncertainty and employee overtime, and the multiple mediating role of the HPWP. In order to test the mediation, I use the procedure proposed by Baron and Kenny (1986) which mainly involves three regression equations. Mediation requires the existence of a direct effect to be mediated. Therefore, the first step of the mediation involves regressing employee overtime on work uncertainty and the control variables. Rather than performing a separate regression analysis for each type of uncertainty, I simultaneously enter variables in a single equation in order to correct for any multicollinearity among them. The results in Model 3 confirm both relationships. Task uncertainty and schedule uncertainty proved to be positively and significantly related to overtime ($\beta = 0.148$, $p < 0.01$; $\beta = 0.217$, $p < 0.01$), thus providing support for hypothesis 2.

Further, the mediation hypothesis implies that work uncertainty is related to the HPWP. In forwarding our mediation hypothesis, I regress each of the HPWP, individually and as a bundle, and the control variables on each type of uncertainty. The results indicate that the majority of the coefficients are positive and significant. However, the relationship between task uncertainty and productivity pay, task uncertainty and the HR bundle[2], and schedule uncertainty and both discretion mechanisms proved to have the opposite signs (see more in Table 5). The next step presumes a positive relation between HPWP and employee overtime which has already been tested in the first model. Finally, employee overtime is regressed on both types of uncertainty, HPWP, and the control variables. When comparing models 3 and 4 (Table 4) results indicate that the significant relationship found between work uncertainty and overtime remains significant, but the coefficients are smaller in magnitude when practices enter into the equation. At the same time, the coefficients of the HPWP remain significant for some of the variables with the exception of productivity pay where the coefficient becomes totally insignificant. The correlations, and the results in Model 1 suggest that productivity pay is positively associated with employee overtime ($r = 0.057$, $p < 0.05$), ($\beta = 0.235$, $p < 0.01$), however Model

4 shows that this relationship is, in fact, nonsignificant when other HPWP, work uncertainty, and the control variables are controlled for ($\beta = 0.029$, n.s.). Other interesting results include the coefficient of discretion over schedule which becomes significant, and with a negative sign. Next, in Model 5, employee overtime is regressed on the HR bundle, the HR bundle^2, the work uncertainty variables, and the controls. Again, the significant relationship found between task uncertainty and overtime becomes smaller in magnitude when the bundle enters into the equation; however the coefficient of schedule uncertainty becomes bigger. At the same time, the HR bundle remains significant, however, the HR bundle^2 becomes insignificant, suggesting no clear support for their mediating role.

Previous researchers suggest that if the reduction is somehow marginal, then the addition of a mediator variable is not the most parsimonious model. To correct for this problem, I use the procedure for testing of mediated effects outlined by Baron and Kenny (1986). In particular, I conducted a Sobel-Goodman test to determine the significance of the mediated effect of work uncertainty on employee overtime via HPWP. The purpose of the Sobel-Goodman test is to assess whether a mediator carries the influence of an independent to a dependent variable, and it works well only in large samples. Performing the test, I find that the mediation effect of training is statistically significant with almost 4% of the total effect of task uncertainty on overtime being mediated and 2% of the total effect of schedule uncertainty on overtime being mediated. The mediation effect of task rotation is statistically significant with 7% of the first total effect and 3% of the second total effect being mediated. However, the mediation effect of productivity pay is negative and statistically significant with 6% of the total effect of task uncertainty on overtime being mediated and positive with 2% of the total effect of schedule uncertainty on overtime being mediated. In addition, the mediation effect of gain sharing is statistically significant with 5% of the first total effect and 0.4% of the second total effect being mediated. Also, the mediation effect of teamwork is statistically significant with 8% of the first total effect and 3% of the second total effect being mediated. The mediation effect of discretion over methods is statistically significant with 9% of the total effect

of task uncertainty on overtime being mediated, while the mediation effect of schedule uncertainty is not significant. Then, the mediation effect of discretion over schedule is statistically significant with 2% of the total effect of task uncertainty on overtime and 0.1% of the total effect of schedule uncertainty on overtime being mediated. The mediation effect of the HR bundle is statistically significant with approximately 26% of the total effect of task uncertainty on overtime being mediated and with approximately 1% of the total effect of schedule uncertainty on overtime being mediated. Finally, the mediation effect of the HR bundle^2 is significant with 0.9% of the total effect of task uncertainty on overtime being mediated, while the mediation effect of schedule uncertainty on overtime is not significant.

I also used bootstrapping following Preacher and Hayes (2004). The results further confirm the mediating effects of training (z= 2.42, p<0.05; z= 4.54, p<0.01), task rotation (z= 4.89, p<0.01; z= 5.91, p<0.01), productivity pay (z= -6.05, p<0.01; z= 3.75, p<0.01), gain sharing (z= 5.32, p<0.01; z= 1.75, p<0.1), teamwork (z= 6.05 , p<0.01; z= 5.95 , p<0.01), discretion over schedule (z= 11.11, p<0.01); (z= 3.10, p<0.01), and the HR bundle (z= 8.53, p<0.01; z= 3.15, p<0.01). All are significant for the relationship between task uncertainty and overtime, and schedule uncertainty and overtime respectively. In contrast, discretion over methods (z= 6.24, p<0.01) is significant only for the relationship between task uncertainty and overtime while the HR bundle^2 is not significant for none of the relationships. These findings suggest that the majority of the HPWP, measured individually or as a bundle, mediate the relationship between work uncertainty expressed either as task uncertainty or schedule uncertainty, and employee overtime; a pattern of results which supports Hypothesis 3 (see Table 6).

Table 4. Results of a Negative Binomial Model for Overtime

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Training	0.199***			0.161***	
	(0.031)			(0.040)	
Task rotation	0.157***			0.096**	
	(0.039)			(0.051)	
Productivity pay	0.235***			0.029	
	(0.058)			(0.075)	
Gain sharing	0.086			0.079	
	(0.066)			(0.093)	
Teamwork	0.122***			0.121**	
	(0.042)			(0.054)	
Discretion over methods	0.005			-0.005	
	(0.025)			(0.030)	
Discretion over schedule	0.018			-0.189***	
	(0.029)			(0.044)	
HR Bundle		0.027***			0.010**
		(0.004)			(0.005)
HR Bundle^2		0.001***			0.001
		(0.000)			(0.001)
Task uncertainty			0.148***	0.126***	0.142***
			(0.023)	(0.025)	(0.024)
Schedule uncertainty			0.217***	0.212***	0.223***
			(0.017)	(0.018)	(0.017)
Controls	Yes	Yes	Yes	Yes	Yes
Constant	-2.427***	-2.282***	-3.561***	-3.523***	-3.510***
	(0.371)	(0.371)	(0.456)	(0.478)	(0.480)
Wald x^2	1539.57	1497.09	1154.12	1121.94	1076.11
Log-Likelihood	-30099.51	-30120.75	-22735.25	-20487.39	-20510.30
N	18,619	18,619	15,284	13,826	13,826

Table 4 continued

Regression coefficients are reported, with standard errors in parentheses. "Yes" means means that the indicated variable is included in each model equation. All regressions include male, age, age^2, tenure, tenure^2, education, 1 work status dummy (fulltime), 5 types of employment contracts dummies, supervision, 4 occupation dummies, firm size, 1 sector dummy, 11 industry dummies and 30 country dummies. Levels of significance: ***p<0.01,** p<0.05, * p<0.1

Table 5. Results of an OLS Model for the Individual HPWP and the HR Bundle

Variables	Training	Task rotation	Productivity pay	Gain sharing	Teamwork	Discretion over methods	Discretion over schedule	HR bundle	HR bundle^2
Task uncertainty	0.065***	0.076***	-0.007***	0.010***	0.057***	0.091***	0.025***	0.882***	-2.998***
	(0.005)	(0.004)	(0.003)	(0.002)	(0.004)	(0.007)	(0.005)	(0.042)	(0.325)
Schedule uncertainty	0.017***	0.029***	0.014***	0.001	0.016***	-0.029***	-0.027***	0.033	-0.041
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.005)	(0.003)	(0.030)	(0.234)
Controls	Yes	Yes	Ye	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.771***	0.459***	0.037	-0.092**	0.559***	-0.723***	-0.251***	-6.876***	34.626***
	(0.092)	(0.079)	(0.051)	(0.040)	(0.075)	(0.130)	(0.086)	(0.792)	(6.151)
R^2	0.212	0.091	0.114	0.097	0.082	0.132	0.124	0.214	0.032
Adjusted R^2	0.209	0.087	0.110	0.093	0.079	0.128	0.120	0.211	0.028
N	15,503	15,533	15,196	15,132	15,522	15,323	15,293	14,119	14,119

Regression coefficients are reported, with standard errors in parentheses. "Yes" means that the indicated variable is included in each model equation. All regressions include male, age, age^2, tenure, tenure^2, education, 1 work status dummy (fulltime), 5 types of employment contract dummies, supervision, 4 occupation dummies, firm size, 1 sector dummy, 11 industry dummies, and 30 country dummies. Levels of significance: *** p<0.01, ** p<0.05, * p<0.1

Table 6. Tests for Mediating Effects

	Sobel-Goodman Test (Baron and Kenny 1986)		Bootstrapping (Preacher and Hayes 2004)	
Variables	Total effect of task uncertainty on overtime being mediated	Total effect of schedule uncertainty on overtime being mediated	Total effect of task uncertainty on overtime being mediated	Total effect of schedule uncertainty on overtime being mediated
Training	4%	2%	z= 2.42, p<0.05	z= 4.54, p<0.01
Task rotation	7%	3%	z= 4.89, p<0.01	z= 5.91, p<0.01
Productivity pay	-6%	2%	z= -6.05, p<0.01	z= 3.75, p<0.01
Gain sharing	5%	0.4%	z= 5.32, p<0.01	z= 1.75, p<0.1
Teamwork	8%	3%	z= 6.05, p<0.01	z= 5.95, p<0.01
Discretion over methods	9%	n.s.	z= 6.24, p<0.01	n.s.
Discretion over schedule	2%	0.1%	z= 11.11, p<0.01	z= 3.10, p<0.01
HR bundle	26%	1%	z= 8.53, p<0.01	z= 3.15, p<0.01
HR bundle^2	0.9%	n.s.	n.s.	n.s.

Supplementary tests are conducted to assess whether estimates are robust to alternate specifications and samples. First, I run an additional regression including four different types of training in an effort to observe whether there are variations in the estimates depending on the training activity applied. Training could be positively related to greater worker time expenditure, but an issue arising is whether this positive link is due to the nature of training activity or because during training employees are performing in a different environment. Results show that training provided by the employer, training paid by the employee, and different forms of on-site training and learning are positively and significantly associated with overtime, whereas for on-the-job training, I find no results. This absence of association might be attributed to the fact that during on-the-job training employees do not lose so much time because of learning compared to other

types of training, suggesting that other training activities better explain variations in employee overtime. Second, previous literature has shown that the use of nonstandard workers seems to be associated with work intensification, and there also seems to be a strong association between work intensification and employees working in the public sector (Green 2004). Therefore, I replicate the analyses in subsamples by dichotomizing the sample into public and private sector employees, fulltime and part time employees, and employees working under indefinite versus employees more temporary contracts. Results proved to vary marginally from those reported in Table 4.

3.6 Conclusions and Discussion

In synopsis, the core idea of the paper conjectures that although HPWP provide a number of benefits to employees, from the other hand they could be one of the important reasons explaining why employees work longer hours. Results provide evidence for this argument and show that the increased effort brought about due to the implementation of HPWP is related to employee working overtime. Thus, findings give support for the work intensification argument. The same pattern of results is found when I test for the mediating role of these practices on the relationship between uncertainty and overtime. As it seems, uncertain environments are more likely to adopt a number of these practices, which in return positively mediate the relationship between work uncertainty and employee overtime.

Yet, I fail to find results for gain sharing and discretion over methods, while for discretion over schedule I find a negative and highly significant coefficient. This estimate infers that giving flexibility to choose schedule decreases employee overtime. This is indirectly in accordance with previous literature which suggests that human resource practices which allow choice over starting and finishing times, flexible hour systems, and individuals' control over their own hours of work reduce job-to-home spillover (White et al. 2003); defined as effects of the employees' jobs on families such as too little time

to carry out family responsibilities or jobs prevent employees from giving the time they would like to their partner or family. Results infer that not all HPWP act as mediators between work uncertainty and employee overtime.

The study has a number of strengths, but also limitations which suggest that findings should be interpreted with caution. First, even though the dataset comes from a rich cross sectional survey which contains a more objective measure of work intensification, and its design provides a very clear picture of the working conditions in Europe, one should bear in mind that there are a number of cautions attached to the findings regarding the cross sectional nature of the research and the potential claims of causation. Second, although a detailed methodological framework has been put in place in order to ensure that the survey is carried out to the highest specifications and scientific standards, self-report, cross-sectional data are susceptible to biases associated with common variance method. This bias is most problematic in studies in which data for both the predictor and the criterion variable are obtained from the same source at one time. This problem lies in the difficulty of determining whether observed covariance among the constructs examined is attributable to valid relationships or to common method variance (Podsakoff et al. 2003). A third point claiming for attention is the notion of complementarity which although very intuitively appealing, it is not easy to be measured. Prior work evaluating this concept has employed divergent measures of human resource complementarity, such as arbitrarily grouping practices intro three or four types of human resource practice bundles or using factor analysis to generate an index of practices with very mixed empirical results (Delaney and Huselid 1996). Following other authors (e.g. MacDuffie 1995), this paper is using a less restrictive strategy which allows a range of combinations and as a result practices are not neatly classified into discrete types. However, there might be other practices affecting employee overtime not included in the bundle. Fourth, the pattern of relationships found in this study is consistent with theoretical arguments suggesting that uncertainty might cause the adoption of HPWP and not the other way around, thus providing initial support for the mediated effects of work uncertainty on employee

overtime. However, a multiple mediator approach implies a specific causal order among phenomena, and the cross-sectional nature of the data does not allow making causal inferences regarding chains of effects.

Adopting a cross-lagged panel design in future research can address these issues and give a more rigorous test of these mediated effects. Also, scholars who are interested in understanding the impact of human resource practices could give more attention to work intensification inferring that benefits attributed to these practices could be achieved through work intensification in the form of longer hours spent at work. It may represent an extreme argument given that the dataset employed for the purposes of the study does not contain any measure of productivity, and thus does not allow making predictions for the other side of the story. Still, findings can challenge previous studies and call into question existing findings that measure productivity without taking into account the change in the number of hours worked. Finally, the finding of this study can offer suggestions to managers who seek to introduce human resource practices in an effort to improve performance, supporting that maintaining a balance between the adoption of human resource practices and work intensification might be of some importance.

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Chapter 4

Learning Through Task Variety Versus Task Specialization: Climbing a Stairway to Heaven. Who Gets There?

4.1 Introduction

Relatively recent literature on organization and individual learning has indicated a number of implicit and explicit references of how assignments should be designed and how the learning rate might be affected by task specialization, related or unrelated task variation (Darr, Argote, and Epple 1995; Fischer and Ittner 1999; Schilling, Vidal, Ployhart, and Marangoni 2003). As it is supported, offering exposure to a broad range of tasks is important because employees who switch between multiple assignments are provided with diverse experiences which allows them to gain breadth of knowledge, resolve or tackle problems more effectively and achieve higher productivity levels (Schilling et al. 2003). On the other hand, the role of task specialization has been mentioned as an important factor in driving firm and employee learning, and has been found to be very tightly

connected to higher productivity since the days of Adam Smith (1776). As argued, dedication to a single activity can maximize the reliability of experience, mainly because it allows task repetition and a deeper understanding of the problem which can yield higher efficiency and higher productivity levels at a specific task (Shilling et al. 2003; Boh, Slaughter, and Espinosa 2007; Narayanan, Balasubramanian, and Swaminathan 2009).

Apart from their learning implications, understanding whether individuals can leverage experience to improve their learning at work seems to have central implications for their career prospects as well. Literature on careers has given attention on the importance of task assignments supporting that they are a primary source of career learning and very critical for employees who seek to move up the career ladder more quickly (Campion, Cheraskin, and Stevens 1994). Yet, little research or theory has focused on different forms of tasks assignments as proactive means of enhancing the value of employee learning for career development. This is important both for managers and employees because in leveraging experience they need to weigh the gains from specialized versus diverse experience in influencing not only learning and productivity, but also employees' ability to take more responsibility and advance their career within an organization.

The paper focuses on the employee learning and career advancement implications of task assignments in conjunction. It sheds light on this issue by disaggregating different task assignments, and focuses mainly on two processes. First, it attempts to determine whether task assignments in the form of related and unrelated task rotation help employees draw linkages between bodies of knowledge and facilitate their career advancement in the firm. Second, it compares the contribution of more to less task complexity on each outcome respectively. Third, it observes whether employee learning and career advancement can be better leveraged through the possible complementarities between task assignments and employee discretion.

In essence, the paper extends prior research in three directions. First, although previous work has tested whether individual learning can be best leveraged through task specialization or through some degree of variation by providing good insights, yet the

evidence is scarce. Results seem somehow inconclusive and they often vary depending on the context. In fact, many times the context of the empirical investigation of these questions has been limited to specific learning domains (Schilling et al. 2003) or to a single industry (Boh et al. 2007). Here, hypotheses are evaluated by using broader datasets from the fourth and the fifth wave of the European Working Conditions Survey (EWCS) which present an overview of the working conditions of nearly 30,000 and 44,000 employed and self-employed individuals respectively. Second, research on careers has examined whether rotating employees is a means through which individuals leverage experience and develop their careers (Campion et al. 1994). Here, it is noted though that the type of rotation might be of different importance in influencing learning and, by extension, the way individual careers are shaped. Third, the paper is departing from previous research by supporting the idea that individuals might need a certain level of discretion within each task, and addresses how different tasks and discretion mechanisms may interactively contribute to individual learning and employee career prospects.

4.2 Theory and Hypotheses

Earlier studies in psychology show that, at the individual level, task variety may enhance an employee's ability to learn by facilitating the development of abstract principles that can be applied to different, but somehow related tasks or problems (Schmidt 1975). Tyre and von Hippel (1997) explain that engineers sometimes need to look at a problem in different contexts in order to be able to understand it better. Also, Loewenstein, Thompson, and Gentner (1999) present a similar phenomenon in their study where they report that students working on different scenarios are able to more rapidly develop a cognitive understanding than students focusing on a single scenario. More recent studies such that of Shilling et al. (2003) find that, at the individual level, learning is greater for employees working on different but similar tasks and lower for employees who are either specialized or work on totally unrelated tasks. Similarly, the work of Narayanan

et al. (2009) shows that some exposure to variety enhances learning and productivity, nevertheless too much exposure to variety or very deep specialization could actually impede them. At the group and organizational level, the study of Boh et al. (2007) reveals that learning from variety is more significant than learning from specialization. In contrast, other studies claim that task enlargement increases the errors employees make while learning, whereas specialization decreases the time spent in learning and the frequency of errors employees make while dealing with new tasks (Campion and McClelland 1991; 1993). In many cases, specialized experience seems to impact more individual productivity, inferring that learning from working on the same task enables employees to gain familiarity and better understanding of the task (Boh et al. 2007).

As extension to that, tasks assignments enhance the value of work experience and facilitate career development. Because of these positive outcomes, many firms have started to create new environments by reorganizing work activities. They have placed considerable attention in promoting increased flexibility through cross-training where the individual worker has the opportunity to work in different tasks (Shafer, Nembhard, and Uzumeri 2001). Among the common ways to provide employee exposure to a wider range of experiences is the notion of employee rotation (Campion et al. 1994). This practice refers to lateral transfers between assignments and it has been discussed in the literature as a means to improve employee skills and abilities at work. As employees move up to other jobs, they need to be aware of different business aspects and rotation seems to facilitate that process. Support comes from surveys that have reported that organizations, particularly large firms, frequently use rotation to develop managers (Foreman 1967; Saari, Johnson, McLaughlin, and Zimmerle 1988). In particular, it has been discussed in the context of developing junior employees to become top managers (Eriksson and Ortega 2006) and managers into generalists (London 1985).

In contrast, exposure to specialization although increases learning, may actually hinder the career advancement of employees either because it is often too hard to replace them or because specialized employees are less equipped to work on different tasks. Past

research provides support for this idea and suggests that exposure to task variety through rotation is a better learning mechanism and it is much more profitable than specialization (Meyer 1994; Ortega 2001).Without rotation employees mainly focus on a single activity. Although specializing in one activity provides adequate opportunity for repetition and deeper learning, still from a learning perspective, it is claimed that employees who rotate accumulate more human capital than employees who do not rotate (Eriksson and Ortega 2006). However, not all rotation might generate equal useful knowledge and skill. According to the task variety argument, learning is more likely to be improved to the extent that rotation requires different skills in each position. Thus, one would expect a positive relationship between rotation and employee learning and career opportunities within an organization, especially when rotation encompasses the acquisition of different skills. Stated more formally:

Hypothesis 1a. Rotation will be positively related to employee learning.

Hypothesis 1b. Employees involved in rotation will have a higher likelihood of advancing their career than employees who do not rotate; especially when rotating positions require different skills.

Another way through which employees are exposed to variety is job complexity. The literature on job and task design seems to associate complexity with enrichment and many times the terms are used interchangeably (Hackman and Lawler 1971; Hackman and Oldham 1975, 1976; Pierce and Dunham 1976; Griffith 1982; Campbell 1988). Hackman and Oldham (1980) define complex jobs as those characterized by high levels of autonomy, skill variety, identity, significance, and feedback. In a later study, Campbell (1988) proposes a framework in which any task characteristic that implies an increase in information load, diversity, or rate of information change can be considered a contributor to complexity. When jobs are complex, employees are expected to engage simultaneously on multiple dimensions of their work, in contrast to less complex jobs which actually restrain such option (Hackman and Oldham 1980; Deci, Connell, and Ryan 1989; Old-

ham and Cummings 1996). In addition, evidence shows that complex jobs can have a substantial impact on a variety of work-related outcomes, such as exercise more initiative (Frese, Kring, Soose, and Zempel 1996; Speier and Frese 1997; Frese, Garst, and Fay 2007). They help also achieve higher supervisor ratings of performance, defined as the employee development of new ideas, than more routine jobs (Oldham and Cummings 1996; Tierney and Farmer 2002; 2004). On the contrary, employees might exhibit lowest performance and satisfaction when their jobs are lowest in complexity and their skills are weaker (Oldham, Kulik, and Stepina 1991).

Again, the notable point here is the emphasis on the reactions of the individual to the task. Engaging on multiple dimensions of work and being exposed to more information increases the rate of employee learning. As a consequence, it further enables employees to show broad ranges of accomplishments and that they possess the necessary skills to perform other kinds of tasks or master new responsibilities. Whereas, less complex tasks sometimes tend to promote underuse of skills and abilities which might undermine learning and prevent workers from demonstrating readiness for more responsible, challenging, and remunerative work. Therefore, on the basis of the task variety approach, it is hypothesized that:

Hypothesis 2a. Task complexity will be positively related to employee learning.

Hypothesis 2b. Employees who work on complex tasks will have a higher likelihood of advancing their career than employees who work on less complex tasks.

If jobs include a varied set of tasks, individuals may need a certain level of discretion within each task. The literature on employee discretion[1] defines autonomy as a practice which brings more flexibility at work allowing employees to organize their work on their

[1]The literature uses different terminology to refer to employee discretion including job autonomy (Hackman and Oldham 1976), task control or participation in decision making (Karasek 1979).

own by choosing the methods and/or their work schedule (Hackman and Oldham 1975; 1976). Designing work to provide discretion is associated with giving employees the opportunity to develop new skills, master a wider range of tasks and responsibilities (Parker 1998; Grant and Parker 2009) as well as increased performance (Osterman 1995; Wood, de Menezes, and Lasaosa 2003; Ortega 2009). Complementary research claims that employees who have discretion can considerably affect the quality of production (Ichniowski and Shaw 1999; Appelbaum, Bailey, Berg, and Kalleberg 2000).

In the case that jobs are complex, it is too costly for the firm to know which actions are optimal, and it is better to let the agent decide which action to take, while when jobs are less complex or more repetitive, employees need less discretion (Prendergast 2002). Therefore, adding discretion to their job may help employees gain flexibility in each task. The higher the level of discretion, the greater the employee involvement and employees tend to learn more when they are more involved with their jobs. In extension, autonomy could signal to firms that employees have the ability to take broader roles (Parker 2000, 2007) and to be assigned to positions that involve greater responsibilities (Ortega 2009). Frequently, it is considered a prerequisite for anyone who plans to stay visible as a job candidate, mainly because autonomous employees are held responsible for work outcomes, and significant accomplishments can be attributed to them. Those employees can demonstrate potential success in positions of higher responsibility, and therefore are more likely to be assigned to higher positions than employees who do not have autonomy at work. Thus, according to the task variety approach:

Hypothesis 3a. Employee discretion will strengthen the positive relationship between task variety and employee learning.

Hypothesis 3b. Employee discretion will strengthen the positive relationship between task variety and employee career advancement.

4.3 Data description

Hypotheses are evaluated by analyzing data from the fourth and the fifth wave of the EWCS carried out in 2005 and 2010. The surveys present an overview of the working conditions of almost 30,000 and 44,000 employed and self-employed individuals respectively. For the purposes of this study only the first category is taken into consideration in the tested sample. The data contain information on employee learning, career prospects, and cover different questions pertaining to task variety, task specialization, and employee discretion. All of them are based on employee self-reporting.

The dependent variables are employee learning and career prospects. The former represents a dichotomous variable showing whether the job of an individual involves learning new things, and the latter represents a categorical variable indicating whether an employee's job offers good prospects for career advancement. The first independent variables of interest are measured with one question about unrelated task rotation indicating whether employees rotate to tasks which require different skills and one on related task rotation indicating whether employees rotate to tasks which require similar skills. Also, one question on complex tasks is included showing whether an employee's main job involves complex tasks and one measuring the contrary, defined as monotonous tasks. Finally, four variables for employee discretion are taken into consideration which depict whether employees are able to choose or change the order of tasks, methods of work, speed or rate of work, and whether they have discretion to apply their own ideas. All are measured using dichotomous questions, except the latter which is categorical. For the first three items I have constructed an index[2], defined as discretion over methods.

Previous research highlights that employee rotation is very closely aligned with certain human resource practices such as training (Osterman 1994, 2000) and teamwork (Erickson and Ortega 2006). In addition, employee discretion at work is part of a wider high-performance work system (Ortega 2009). It seems that a complementary relationship

[2]All items have been standardized to have a 0 mean and a standard deviation equal to 1 before I construct the index. For discretion over methods, Cronbach's alpha is 0. 0.75 and 0.79 respectively.

exists among these practices, and the implementation of the one usually facilitates the implementation of the other. Therefore, two variables on human resource practices are defined, training and teamwork, as main controls. The first variable is constructed out of three different types of training mentioned in the survey: training provided by the employer, training paid by the employee, and on-the-job training. The variable takes 1 in case of having received any of the three training activities and 0 otherwise. The second variable is also measured dichotomously and shows whether an employee's job involves doing all or part of his work in a team.

A number of other controls are also added aiming to capture potential exogenous effects stemming from the heterogeneity in the sample. One binary variable for gender is included in order to capture gender differences. Continuous variables for age and age^2 are added as a proxy for work experience (Dokko, Wilk, and Rothbard 2009) and tenure and tenure^2 as a proxy for ability (Ortega 2009). To account for the schooling level of employees, a categorical variable is used about the highest level of education that employees have completed[3]. Employee skills is also included to account for ability with a variable coded -1 if employeew need further training to cope well with their duties, 0 if their duties correspond well with present skills and 1 if they possess skills to cope with more demanding duties. To deal further with the individual heterogeneity, the linear effects of the number of employees under each employee's supervision, and number of hours worked are also taken into account along with a categorical variable for firm size, and dummy controls for sector, type of employment contract, occupation, industry, and country[4]. Next, Table 1 reports summary statistics for all main variables.

[3] One-digit ISCED code.

[4] The occupational and industry dummies are based on the International Standard Classification of Occupations (ISCO-88) and countries are Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom.

Table 1. Summary Statistics

	EWCS 2005			EWCS 2010		
Variables	N	Mean	Std.Dev.	N	Mean	Std.Dev.
1. Career	24,663	1.655	1.238	39,578	1.751	1.203
2. Learning	24,837	0.731	0.444	41,118	0.680	0.466
3. Unrelated task rotation	24,753	0.397	0.489	40,915	0.343	0.475
4. Related task rotation	24,753	0.103	0.304	40,915	0.094	0.292
5. Complex tasks	24,668	0.624	0.484	40,960	0.562	0.496
6. Monotonous tasks	24,784	0.426	0.494	41,021	0.457	0.498

4.4 Models and Results

Hypotheses are tested using the following model specification:

$$y_i^* = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i1} X_{i2} + \beta_4 Controls_i + \varepsilon_i$$

Where β_3 is the coefficient corresponding to the product. I estimate a series of models using logit for learning (columns denoted as a) in conjunction with ordered logit for career (columns denoted as b). Conducting two separate sets of regressions for 2005 and 2010 lead two similar results, shown in Table 2. Moving from left to right, estimates from the first two identical models indicate that unrelated task rotation and task complexity have a positive and very significant relationship with employee learning. In contrast, rotating tasks which require similar skills show a negative and insignificant relationship with employee learning, while monotonous tasks show a negative and highly significant relation with it. Discretion over methods and discretion over ideas show a significantly positive coefficient as well. As observed, the signs and significance of the estimated coefficients are quite stable across the two models. A similar pattern of results is observed in Model 2 when estimating the relationship between task assignments and career prospects. The coefficient of unrelated task rotation is positive and marginally significant

for 2005, however negative and not different from zero at a statistically significant level for 2010. The coefficient of related task rotation is negative and marginally significant. Furthermore, working in complex tasks seems to be positively and significantly related to career prospects whereas working in monotonous tasks has the opposite relationship. Regarding the discretion variables, both show positive and significant signs. Estimations give support to the hypotheses which are consistent with the notion that task variation instead of task specialization is positively related to employee learning and employee career prospects, with very minor exceptions.

Table 2. Estimates of Logit and Ordered Logit Models

Variables	Model 1: Learning (α)		Model 2: Career(β)	
	(2005)	(2010)	(2005)	(2010)
Unrelated task rotation	0.572***	0.574***	0.054*	-0.002
	(0.050)	(0.040)	(0.031)	(0.026)
	1.771	1.775	1.056	0.998
Related task rotation	-0.101	-0.003	-0.081*	-0.076**
	(0.066)	(0.052)	(0.048)	(0.038)
	0.904	0.997	0.923	0.927
Complex tasks	1.549***	1.635***	0.247***	0.272***
	(0.045)	(0.035)	(0.031)	(0.025)
	4.706	5.127	1.280	1.312
Monotonous tasks	-0.312***	-0.188***	-0.349***	-0.335***
	(0.044)	(0.034)	(0.029)	(0.023)
	0.732	0.828	0.706	0.715
Discretion over methods	0.229***	0.264***	0.067***	0.057***
	(0.026)	(0.020)	(0.018)	(0.015)
	1.258	1.302	1.069	1.059
Discretion over ideas	0.239***	0.184***	0.274***	0.263***
	(0.016)	(0.013)	(0.011)	(0.010)
	1.270	1.203	1.316	1.300
Training	0.899***	0.871***	0.311***	0.382***
	(0.046)	(0.035)	(0.030)	(0.024)
	2.457	2.389	1.365	1.465
Teamwork	0.261***	0.170***	0.113***	0.126***
	(0.046)	(0.036)	(0.031)	(0.025)
	1.299	1.185	1.120	1.134
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Pseudo R^2	0.310	0.315	0.076	0.085
Log Likelihood	-7465.80	-12099.90	-26930.76	-39266.58
Observations	19,140	28,811	19,009	28,229

Note: The table reports estimated coefficients, and standard errors (in parentheses).Italised numbers represent the odds ratios. All regressions include controls for Male, Age, Age^2, Tenure, $Tenure^2$, Education, Skills, Supervision, Hours, 5 type of contracts, 9 occupation dummies, firm size, public sector, 16 industry dummies, and 29 country dummies. Levels of significance: ***p<0.01, ** p<0.05. * p<0.1.

Table 3 presents the results after introducing the interaction terms. In general, the coefficients keep the same sign, however some of them lose significance. Support is still provided from the direct relationship of unrelated task rotation and learning, as well as the relationship between complex tasks, monotonous tasks, the two discretion mechanisms, and the outcome variables. Among the indirect effects, the interaction between employee discretion over methods and complex tasks is negative and significant in model 3 for the year 2010. Thus, hypothesis 3a is not supported. The interaction between employee discretion over methods and complex tasks is positive and significant indicating that employee discretion intensifies the relationship between complex tasks and career prospects. This pattern of result supports hypothesis 3b. Interestingly and contrary to what it has been hypothesized, the inclusion of the interaction term between employee discretion over ideas and monotonous tasks is positive and highly significant inferring that when employees work in monotonous tasks, giving them discretion to apply their own ideas is related to better career prospects.

Table 3. Estimates of Logit and Ordered Logit Models

Variables	Model 1: Learning (α)		Model 2: Career(β)	
	(2005)	(2010)	(2005)	(2010)
Unrelated task rotation	0.560***	0.616***	0.055	-0.045
	(0.096)	(0.078)	(0.069)	(0.057)
Related task rotation	-0.114	0.025	-0.058	-0.018
	(0.124)	(0.101)	(0.096)	(0.078)
Complex tasks	1.462***	1.587***	0.277***	0.338***
	(0.086)	(0.070)	(0.064)	(0.052)
Monotonous tasks	-0.390***	-0.249***	-0.474***	-0.465***
	(0.085)	(0.069)	(0.062)	(0.051)
Discretion over methods	0.316***	0.311***	0.002	0.021
	(0.048)	(0.036)	(0.036)	(0.028)
Discretion over ideas	0.212***	0.175***	0.257***	0.246***
	(0.029)	(0.023)	(0.022)	(0.018)
Discretion over methods x	-0.082	-0.094**	0.049	-0.037
Unrelated task rotation	(0.058)	(0.044)	(0.038)	(0.031)
Discretion over methods x	-0.103	-0.006	-0.027	-0.005
Related task rotation	(0.077)	(0.060)	(0.058)	(0.046)
Discretion over methods x	-0.018	0.013	0.096***	0.065**
Complex tasks	(0.052)	(0.041)	(0.037)	(0.029)
Discretion over methods x	-0.081	-0.046	-0.014	0.031
Monotonous tasks	(0.051)	(0.040)	(0.036)	(0.028)
Discretion over ideas x	-0.003	-0.029	0.001	0.016
Unrelated task rotation	(0.034)	(0.028)	(0.023)	(0.020)
Discretion over ideas x	-0.007	-0.012	-0.012	-0.026
Related task rotation	(0.045)	(0.038)	(0.034)	(0.029)
Discretion over ideas x	0.036	0.023	-0.008	-0.027
Complex tasks	(0.031)	(0.026)	(0.022)	(0.019)
Discretion over ideas x	0.026	0.022	0.048**	0.056***
Monotonous tasks	(0.031)	(0.026)	(0.022)	(0.018)

Table 3 continued

Variables	Model 1: Learning (α)		Model 2: Career(β)	
	(2005)	(2010)	(2005)	(2010)
Training	0.898***	0.871***	0.313***	0.384***
	(0.046)	(0.035)	(0.030)	(0.024)
Teamwork	0.262***	0.173***	0.113***	0.127***
	(0.046)	(0.036)	(0.031)	(0.025)
Controls	Yes	Yes	Yes	Yes
Pseudo R^2	0.310	0.315	0.077	0.085
Log Likelihood	-7461.81	-12094.40	-26921.88	-39255.26
Observations	19,140	28,811	19,009	28,229

Note: The table reports estimated coefficients, and standard errors (in parentheses). All regressions include controls for Male, Age, Age^2, Tenure,$Tenure^2$, Education, Skills, Supervision, Hours, 5 type of contracts, 9 occupation dummies, firm size, public sector, 16 industry dummies, and 29 country dummies. Levels of significance: ***p<0.01, ** p<0.05, * p<0.1.

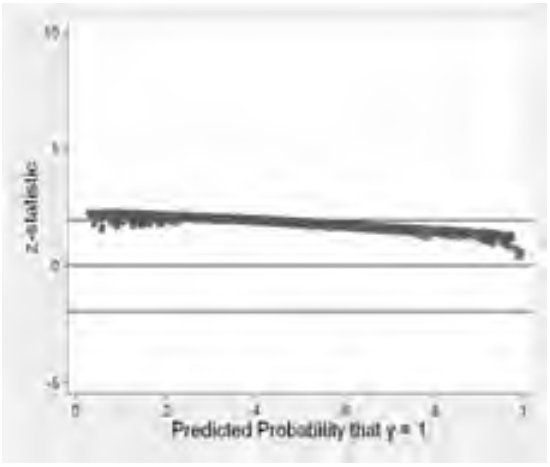
In nonlinear models, however, the interpretation of the coefficient of the interaction terms is not as straightforward as in linear models. Scholars suggest that the method for testing an interaction effect in nonlinear models differs substantially from that used in OLS, mainly because of two reasons. First, regressor's marginal effect does not equal the variable's model coefficient and the value of this marginal effect varies with the value of all model variables. Second, in nonlinear models there is no measure of model fit similar to the R-square in OLS, and, as a result, model assessment is limited to testing the joint significance of all model variables (see more in Wiersama and Bowen 2009). Recent inquiries suggest that in order to identify the true interaction effect for nonlinear model, supplementary analysis is needed in which interactions effects can be better examined graphically in order to provide a more complete assessment of the nature of an interaction effect (Norton, Wang, and Ai 2004; Wiersama and Bowen 2009)[5].

[5]Norton et al. (2004) present illustrations for calculating and graphing the magnitude and significance

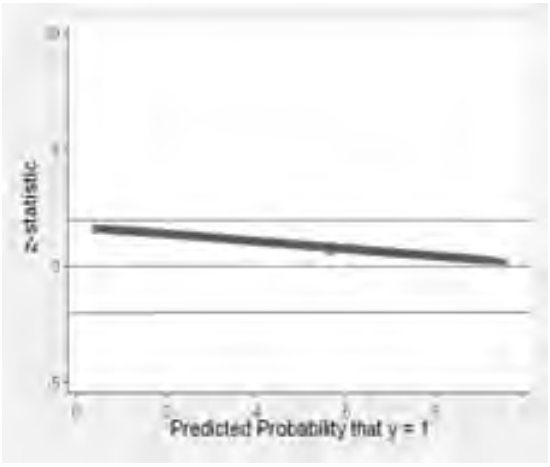
Taking into account the aforementioned issues, the categorical dependent variable of career prospects is converted to a dummy and separate logit models for each interaction term are introduced. In particular, eight interaction terms are added sequentially for each survey; four for employee discretion over methods and each task assignment, and four for employee discretion over ideas and each task assignment. Scatter graphs are generated which illustrate additional analysis for logit models with predicted probabilities on the x-axis and plot the interaction effect calculated by the conventional linear method and by the method suggested by Norton et al. (2004) against predicted probabilities. Bellow, I illustrate graphically the interactions that are found to be significant. As observed, interactions between discretion over methods and complex tasks for 2005 and 2010 are statistically significant for all the observations. The interactions between discretion over ideas and monotonous tasks, however, vary widely with the majority of the observations being positive and significant.

Graph 1. z-statistics of Interaction Effects after Logit: Discretion over Methods and Complex Tasks

EWCS 2005



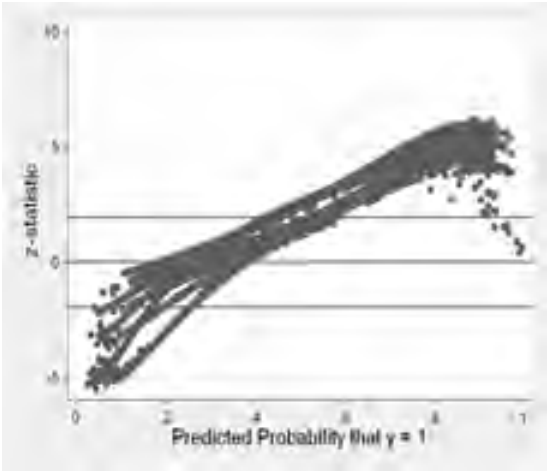
EWCS 2010



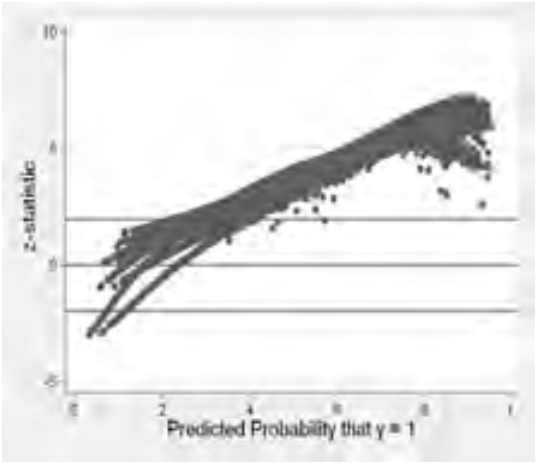
of an interaction effect after logit models.

Graph 2. z-statistics of Interaction Effects after Logit: Discretion over Ideas and Monotonous Tasks.

EWCS 2005



EWCS 2010



In addition to the main analysis reported above, estimates after logit are compared with that of a linear probability[6] where the interaction effect is simply the coefficient of the interaction term. OLS gives predicted values outside the (0,1) range but provides more accurate predictions regarding the interaction terms, whereas logistic regression gives more accurate predictions of probabilities on the dependent outcome. Both regression analyses produced similar results and thus, proved consistent

4.5 Conclusions and Discussion

In synopsis, results indicate that employees exhibit higher learning and higher intentions for career growth when their jobs involve unrelated task rotation, complex tasks, and discretion. Whereas, employees show lowest learning, and career prospects when they work under related task rotation or monotonous tasks. When interaction terms are introduced to test how the relationship between task variety and career prospects depends on the magnitude of employee discretion, findings reveal positive and significant effects for

[6]OLS coefficients measure changes in expected values of career prospects, while logistic coefficients measure changes in the log odds that career prospects equal 1.

two interactions; for the interactions between discretion over methods and complex tasks, and interestingly, for the interactions between discretion over ideas and monotonous tasks. Overall, the stability of the results across estimations lends credence to findings.

The estimated results shed light in understanding the relation between various tasks assignments, learning, and career prospects. In essence, they are consistent with arguments suggesting that task variation stimulates employees to develop a wider understanding of the tasks than they would if they had performed only one type of task. Additionally, different tasks seem also to facilitate career growth. However, due to the cross-sectional nature of the data, the direction of causality is not always clear. Future research could address this issue by utilizing a longitudinal design with repeated measurement of key variables at appropriate intervals that allow tests of reciprocity. Also, the paper examines individual-level data, therefore one must exercise caution in generalizing the findings to other levels. Future research should attempt to replicate these findings at various levels of analysis to determine whether there are systematic differences in the ways that task variation impacts learning and career prospects.

4.6 References

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